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JOHN M. MAISCH.

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NOTES ON VEGETABLE DRUGS USED IN MEXICO.

By John M. Maisch.

On the appearance of the second edition of the Mexican Pharmacopœia, a series of articles published in this Journal in 1885 and 1886, gave an account of the drugs admitted into that work, the title of the papers being "Materia Medica of the New Mexican Pharmacopœia." Quite recently—the introductory part is dated October 28, 1890—additions to that Pharmacopœia have been issued under the title of "Apéndice á la segunda edicion de la Nueva Farmacopea Mexicana de la Sociedad Farmacéutica de México; escrita por la Comisión Permanente de Farmacopea." The work is printed in a style conforming to that of the main work, the additions being contained upon 51 pages, not including index or preliminary matter. The permanent commission was the same as the one who edited the Pharmacopœia, except Dr. Fernando Altamirano, who was appointed in the place of Dr. Soriano, resigned. The other members are Professors Alfonso Herrera, José M. Lasso de la Vega and Severiano Pérez.

It is intended to give in the present paper an account of the vegetable drugs admitted, and of such corrections of previous statements, as well as of such other notes that may appear to merit special notice. Instead of following the alphabetical arrangement according to the Spanish names of the drugs, a more comprehensive view will probably be had by considering the drugs under the botanical names of the plants grouped together in natural orders.

Anacardiaceæ.—Rhus Toxicodendron, *Linné*, grows from the valley of Mexico and from Jalapa northward, and is popularly known as *mala mujer*, *guau*, etc. The leaves are used in incontinence of urine; a hot strong decoction is employed against the bites of poisonous animals by bathing the affected parts, and the juice is given for coughs in doses of five drops, with a hot aromatic infusion. The alcoholature (tincture of the fresh leaves) has been used by Dr. Garcia in elephantiasis (mal de San Lazaro).

Tapiria cyrtocarpa, *Bentham et Hooker*, *copalcocote;* the seeds are said to cure lepra.

Apocynaceæ.—Aspidosperma Quebracho, *Schlechtendal*, yields *quebracho blanco*, the bark being given in doses of 1 to 4 gm.

Asclepiadeæ.—Asclepias Cornuti, *Decaisne*, grows near the northern frontier of Mexico, and is known as *soliman vegetal.* The rhizome is used in doses of 0·5 to 1 gm.; the fresh milk-juice serves for destroying warts, and after drying as a sternutatory.

Berberideæ.—Berberis pinnata, *H. B. K.*, known as *cachisdá*, grows in Guanajuato, Toluca, etc. The constituents of the root bark are probably analogous to those of Berberis vulgaris. The comestible fruit is employed as an antiscorbutic, and the bark as a laxative; the wood is used for dyeing yellow.

Cacteæ.—*Tuna* is the name by which the fruit of several species of Opuntia are designated. They are regarded as possessing diuretic properties and are employed for curing diarrhœas, while the juice is used in biliary affections; the flowers have the reputation of being useful in pectoral complaints. Among the economical uses of the berries may be mentioned that they are eaten as table fruit; that a very agreeable fermented beverage, known as *colonche*, is made from the juice in San Luis Potosi; and that the fruit is converted into a preparation called *queso de tuna* (tuna cheese).

Capparideæ.—Polanisia uniglandulosa, *Cavanilles*, which grows in the valley of Mexico, Puebla, etc., is the *yerba del coyote*, and is employed as a stimulant, stomachic and vermifuge, and externally for its rubefacient properties.

Connaraceæ.—Rourea oblongifolia, *Hooker et Arnott*, var. floribunda, which is found in Southern Mexico, Vera Cruz, etc., is called *chilillo de la huasteca.* The root is flexuose, little branched, annu-

late from complete or interrupted wrinkles, brown, the liber and meditullium of a reddish color, the latter compact and upon transverse section appearing porous from the ducts, of a peculiar odor and a somewhat astringent taste. Professor Guzman showed the presence of resins soluble and insoluble in alcohol, orange yellow coloring matter, volatile acrid principle and tannin. The root is used for dyeing hides of a light brown color.

The testa of the seeds is blackish brown, glossy, fragile, at the base provided with a yellowish fleshy arillus cleft in the anterior part; the tegmen is whitish, membranous, and is intimately united with the oily cotyledons, which are convex upon the back and concave upon the face. Fats, neutral and acid resins, volatile oil, tannin, glucose, pectin compounds and a volatile acrid principle, identical with that of the root, were found in the seeds by Prof. Guzman. The seeds appear to possess tetanic properties, and are used against itch and various skin diseases, also, like the roots, for poisoning prairie wolves (*coyotes*). It is asserted by the rural inhabitants that dogs eating the bones of the *cojolite* (*Penelope purpurascens*) and of other gallinaceæ having fed upon the fruit of the chililló, die with symptoms of poisoning, but that men may eat with impunity the flesh of the same birds.

Compositæ.—This order furnishes a much larger number of additions than any other order.

Ambrosia artemisiæfolia, *Linné*, grows throughout North America to the central part of Mexico, and according to Professor F. Barradas, contains fat, volatile oil, neutral resin, gum, tannin, starch (?), etc. It is stimulant, emmenagogue, and febrifuge, and appears to act as a good anthelmintic. In the same manner is used Ambrosia elatior, *Linné*, which is also indigenous to Mexico, and has leaves attaining a length of 16 cm. and a width of 10 cm., less deeply divided, and provided with ciliate petioles; it is destitute of the bitter taste of the former species.

Baccharis conferta, *Kunth, yerba del carbonero*, is a diœcious woody plant; leaves alternate, nearly sessile, obovate, cuneate at the base, with few teeth, the upper ones entire, rough, glossy, glandular, and coriaceous; involucre imbricate, the outer scales small and oval-lanceolate, the inner ones larger and linear, all with a whitish margin; receptacle flat, pitted; akenes compressed, striate, the pappus in several series; aromatic and bitter. According to

A. Martinez, the plant contains acid resin, volatile oil, fat, yellow coloring matter, gum, tannin, etc. The infusion of the leaves enjoys considerable reputation against coryza.

B. multiflora, *Kunth*, and B. Alamani, *DeCandolle*, like the preceding species, grow in the valley of Mexico, and are known by the same popular names.

Calea Zacatechichi, *DeCandolle*, grows in Vera Cruz, Orizaba and other localities of Southern Mexico. Leaves petiolate, oval, subtriplinerved and, like the whole plant, pubescent; heads radiate, twelve-flowered; involucre cylindric; scales obtuse, the margin scarious; akenes top-shaped; inodorous, bitter. For use, see AMER. JOUR. PHAR., 1886, p. 122.

Cirsium mexicanum, *DeCand.*, is recognized as *cardo santo*; but the following plants are likewise popularly known by the same name; Cnicus acantholepis and C. rhaphilepis, *Hemsley*, in the valley of Mexico, and Carduus tenuiflorus, *DeCand.*, in Jalisco.

Eupatorium (Brickellia, *Asa Gray*) veronicæfolium, *Kunth*, is known as *gobernadora de Puebla*, *orégano del cerro*, *pexto*, etc. Leaves small, cordate or reniform; heads discoid, blue, then rose-colored, hoary pubescent, of a musklike odor, and bitter and pungent taste. It contains resins, volatile oil, yellow coloring matter, tannin and a bitter principle named *eupatopextin*. The infusion is used in gastralgia and in atonic dyspepsia, and in the form of baths or fomentations for soothing arthritic and rheumatic pains.

Helenium mexicanum, *Kunth*, is called *yerba de las animas*. Heads radiate; involucral scales many, in one row, united below, equal linear, hispid, reflexed; receptacle nearly spherical, with small membranous lanceolate chaff near the margin, otherwise naked; ligules pistillate, oblong, three-cleft, yellow, pellucid-punctate; disk-florets harmaphrodite, tubular, five-toothed, yellowish-brown; akenes obovate, compressed, covered with short and rigid hairs, the chaffy scales of the pappus membranous, transparent and slender above. An analysis by Professor P. A. Carrillo showed the presence of volatile oil, acid resin, coloring matter, fat, bitter substance, tartaric acid, and a poisonous alkaloid named *andrealfonsine*. The powdered drug is used as a powerful errhine.

Heterotheca inuloides, *Cassini;* valley of Mexico, Aguascalientes, etc. Heads radiate; involucre campanulate, the scales in several series, linear, hairy and scarious on the margin; florets yellow, the

ligules in one row and pistillate, the tubular florets hermaphrodite; akenes cuneiform; pappus double, the inner row reddish, and the outer row short and whitish; odor mild, taste bitter. Resin, yellow color, tannin, gallic acid, gum, fat, bitter principle, and a trace of volatile oil were ascertained to be present by Pr. Reyes Bruciaga; arnicine is absent. The flowers are known as *arnica del país*, and are employed in the place of arnica flowers; but such substitution should not be made, nor has it been proven that they have the same properties.

Lænnecia parvifolia, *DeCandolle;* near Toluca and in the northeastern part of the valley of Mexico. Leaves sessile, oblong, acute, featherveined, tomentose; heads ligulate; involucre imbricate; pappus silky; inodorous, bitter. A neutral amorphous yellow bitter principle was obtained by Sandoval, besides resin, tannin, gum, etc. The plant, which is known as *simonillo* or *false zacatichichi*, has been used by Dr. Altamirano in the form of infusion against biliary calculi, and the extract in pills as an aperient.

Parthenium Hysterophorus, *Linné*, grows in the valley of Mexico, Orizaba, Córdoba, Monterrey, etc., and is known as *cicutilla confitilla* or *yerba amarga*. For description and use of the plant, see AMER. JOUR. PHAR., 1886, p. 451; 1887, p. 70, and 1890, p. 121.

Piqueria trinervia, *Cavanilles*. Herbaceous; stem and branches with two lines of hairs; leaves opposite, oval-lanceolate, serrate, three-nerved; heads homogamous with the white florets perfect; involucral scales four, mucronate; receptacle flat, naked; akenes reversed pyramidal, pentagonal, five-ribbed, and without pappus. Frías obtained from the plant volatile and fixed oils, amorphous acid, etc. The plant is popularly known as *yerba del tabardillo* or *de San Nicolás*, and is employed in infusion as a stimulant and febrifuge.

Peritre del Cáucaso, different species of Pyrethrum, furnish the well-known insect powder, which is employed for killing fleas and other parasites.

Senecio Grayanus, *Hemsley* (Cacalia decomposita, *Asa Gray*), and S. cerviariæfolius, *Hemsley*, grow in Chihuahua, the second species also in Oaxaca and Chiapas, the plants being known as *matarique*, *maturin* or *guereña*. The rhizomes vary in form and attain a thickness of about 3 cm.; they are gray, above with a dingy gray tomentum, and with irregular depressions and thin scales upon the sur-

face; transverse section shows a thin gray bark containing some resinous dots and near the wood a resin circle of a reddish-brown color; the wood is pale greenish-yellow and contains resin dots. Rootlets numerous, 10 to 15 cm. long, 3 to 4 mm. thick; gray, longitudinally wrinkled, brittle, fracture even; the transverse fracture shows a very thin gray exterior circle, next a much broader glossy layer, followed by a circle of reddish-brown resin dots near the meditullium, the latter being of the same color as the second layer of the bark. Odor strongly aromatic; taste persistently bitter and pungent. The drug contains resin, volatile oil, tannin and glucose, according to Altamirano; but, according to Henckel, the active principle is a glucoside resembling digitalin in its action.

A subcutaneous injection of 0·12 gm. of the alcoholic extract given to a frog, causes paralysis of the voluntary and cardiac motions; 0·50 gm. of the same preparation, in intravenous injection, to a dog, produces general analgesia, diminution of the blood pressure, pulsations and respirations, lasting for one or two hours, and afterward disappearing completely. Taken internally, the drug has an emetic and purgative action which, however, is quite variable. The tincture, applied to the skin, is used as an analgesic, and as an antiseptic to wounds and ulcers. For internal use, the dose is two spoonfuls of the tincture diluted with water, given in various portions during the day.

Senecio tolucanus, *De Candolle*, is the *rabanillo* or *niños del monte* of San Luis Potosi, Sierra de Jaripeo, etc. Stem erect, fistular, glabrous and fluted; leaves semiamplexicaul, oval, serrate, about 24 cm. long and 8 cm. broad; heads radiate, yellow; involucre campanulate, calyculate, in one row; receptacle naked, flat, alveolate; ligules obtuse, pistillate; disk-florets perfect; anthers caudate; pappus white, plumose, in one row; odor unpleasant; taste somewhat pungent. The plant possesses tetanic properties. Besides fat and a volatile principle, Vélez isolated the alkaloid *toxisenecine*, which crystallizes in oblique rhombic prisms.

Solidago mexicana, *Kunth*, has the leaves sessile, semiamplexicaul, lanceolate, narrowed below, entire and glabrous, about 8 cm. long; heads in axillary racemes; involucral bracts small, scarious on the margin; ligules pistillate; disk-florets perfect; receptacle naked; pappus simple; inodorous; taste herbaceous and acrid.

Solidago velutina, *De Candolle*, like the preceding species, is

known as *calancapatle de Mexico* (see also AMER. JOUR. PHARM., 1885, p. 387), and differs from the former by having the stem tomentose above, and the leaves obovate, mucronate, rough above, and with two lateral nerves running from the mid-rib, about one-third from the base.

The decoction and powder of both plants are used topically as vulneraries in atonic ulcers.

Stevia salicifolia, *Cavanilles*. The tincture of the fresh-flowering branches, containing volatile oil and resin, is employed in rheumatic arthritis, and as a substitute for arnica in contusions. The popular name of the plant is *zazale de olor*, which is also given to species of Galium, Mentzelia and other adhesive plants.

Verbesina Capitaneja, *Nees*, is the *capitaneja* of Mexico (see also AMER. JOUR. PHAR., 1885, p. 388). Stem erect, four-winged; leaves sessile, decurrent, opposite, entire, with hexagonal meshes of the veins; heads radiate; involucral scales in two rows; receptacle chaffy; ligules sterile, oval, with four nerves uniting above; disk-florets perfect; akenes oblong, with a membranous wing and two awns; inodorous. *V. crocata* is easily distinguished by the lower leaves being hastate, and the upper ones pinnatifid. Professor Leon de la Pena found in the plant neutral and acid resins, tannin, gum, etc.

Cruciferæ.—Two species of Lepidium are employed under the common name of *coclearia del país*. L. latifolium, *Linné*, was introduced by D. Vicente Cervantes, and grows near Chapultepec, Toluca, etc. L. virginicum, *Linné*, is found throughout the valley of Mexico. Both are employed as substitutes for Cochlearia officinalis, *Linné*. But the popular name given above is also applied to Ranunculus tridentatus and Ran. Cymbalaria, *Pursh*, which have different properties, and are poisonous.

Cyatheaceæ (Filices).—Cyathea mexicana (?) *Chamisso et Schlechtendal*, is the *ocopetate* or *cola de mono* of Cordoba, the State of Vera Cruz, etc. The hairs covering the young fronds are topically employed for their hæmostatic properties in the same manner as those of Cibotium Baromez, *Kunze*. They are yellow, curly, soft, glossy, articulated, about 3 cm. long, inodorous and tasteless; each plant produces from 15 to 20 gm. of hairs.

Euphorbiaceæ.—Jatropha Curcas, *Linné*, growing in Cordoba,

Colima, Morelos, etc., furnishes the *piñoncillo* or *piñon de Indias*, the purging nut of our commerce. The seeds are of about the size and shape of ricinus seeds, are rounded upon the back, have the raphe upon the ventral side, and at one end a circular scar; the surface is black, rough, not glossy, irregularly fissured; kernel surrounded by a transparent integument, oily, inodorous, of an acrid taste. The seed and oil are dangerously drastic, and the oil vesicating like croton oil, but milder. The oil is given in doses of 2 to 8 drops. In cases of poisoning Dr. Grosourdi has recommended good wine and brandy given freely.

Gramineæ.—Zea Mays, *Linné.* The styles or corn silk, called *jilotes* or *cabellos de elote*, are used for their diuretic and lithontriptic properties, and in rural districts are smoked like tobacco.

Hamamelideæ.—The leaves of Hamamelis virginiana, *Linné*, are tonic and astringent, and are given in doses of 4 gm. in decoction.

Hippocrateaceæ.—Hippocratea obcordata, *Lamarck*, grows in Tasco, and is known as *coanabichi.* The infusion of leaves and flowers is employed as a cough remedy, and the seeds yield a fixed oil which may be used in the place of oil of almonds.

Juglandaceæ.—Carya olivæformis, *Nuttall*, the pecan-nut of our Western and Southwestern States, grows in San Luis Potosi, Oaxaca, Queretaro, etc., where the fruit is known as *nuez encarcelada*, or *nuez chiquita.* The seeds are comestible, and yield a considerable quantity of fixed oil. The bark of the branches has been recommended as an antiperiodic and in dyspepsia. A strong decoction of the epicarp is used as an astringent in leucorrhœa.

[*To be continued.*]

THE MEDICINAL AND OTHER USEFUL PLANTS OF ALGERIA.

By P. L. Simmonds, F.L.S.

At the Paris International Exhibition there were published and circulated many important treatises and essays on the vegetable products of different countries, and among others I met with one concerning those of the Algerian Colony, which is deserving of more extended circulation. I have, therefore, thought it useful to translate and condense some of the details furnished therein, since they were submitted by Messrs. Bathandier and Trabut, Professors of the School of Medicine. Possessing as Algeria does a remarkably

rich flora and a climate which admits of the culture of the plants of the temperate, as well as the subtropical regions, with the added knowledge which the Arabs have derived of the therapeutical knowledge of the Greeks as to simples and perfumes, the industry of medicinal plants, and distilled perfumes has been largely developed, of late years, in the colony by the French.

The popular knowledge of the uses of plants is extensive among the native population, and varied according to the districts, while some are not generally known elsewhere. I therefore follow the families of plants in their natural orders.

RANUNCULACEÆ. — *Anemone palmata*, plant strongly vesicant, according to the experiments of Professor Bomlier. *A. coronaria*, and *Clematis cirrhosa* and *C. Flammula* have analogous properties.

Delphinium Staphisagria.—Dr. Bernon cites, in 1880, a case of poisoning with the seeds.

PAPAVERACEÆ.—*Papaver somniferum.* In its wild form this plant is common. The culture of the opium poppy succeeds, but has not been found remunerative.

Papaver Rhœas. The flowers of this species are largely collected for medical use.

Argemone mexicana and *Eschscholtzia californica*, plants said to contain morphine, prosper well here.

Many of the cruciferous plants have fallen out of use in Algeria.

CISTACEÆ.—The leaves of the *Cistus albidus* are employed by the Arabs for tea. *C. ladaniferus* is very common, but the resinous product is not used.

VIOLACEÆ.—*V. odorata* is gathered in small quantity for medical use; it used to be grown at Bonfante for perfume, but is now chiefly used for bouquets. The woody violets are all emetic and it would be worth while experimenting with. *V. arborescens* is common in the thickets of Tell.

CAROPHYLLACEÆ.—*Spergularia rubra.* Much used as a diuretic under the name of *Arenaria rubra.* One house of Algiers exports annually 400 to 500 pounds.

MALVACEÆ.—The flowers and leaves of *Malva sylvestris* are gathered for medical use. The Arabs employ the leaves as a vege-

table. The firm of Legout & Peyron export 2,500 to 3,000 pounds of leaves of *M. sylvestris, macrocarpa, nicæensis, Lavatera critica*, etc.

GERANIACEÆ.—Many of the *Erodiums* have large astringent roots, but the most important product of this family is the geranium oil, obtained by distilling the leaves of various species of *Pelargonium*, as *P. capitatum* and *P. roseum*, cape plants much cultivated in Algeria. There are three cuttings yearly of the leaves. In Algiers alone there are 48 distillers who produce 6,600 pounds of essence. Messrs. Chiris & Gros make about 4,000, and many other settlers produce large quantities.

RUTACEÆ.—Among the species rich in essential oil are: *Ruta graveolens, R. chalepensis and montana*, growing wild and cultivated, and *Haplophyllum tuberculatum*. *Peganum Harmala* and its seed are much employed by the Arabs for rheumatism, purulent ophthalmia and skin diseases.

AURANTIACEÆ.—Although the orange tribe is largely cultivated in Algeria, their medicinal products have not been largely utilized. Several industries have distilled essences of lemon and bergamot, but have not made much headway. Chiris & Gros alone make essences of lemon and petit grain, but have had to give up their Bigarade, owing to the low price at which an essence, passing under the name of "Paraguay," is sold. This firm make about 350 to 420 pounds of neroli oil yearly. Orange flower water is produced in large quantity, and of excellent quality, by the Moors. Orange leaves are largely exported. The manufacture of citric acid has not been attempted, but lemon juice is made for the navy and marine.

TEREBINTHACEÆ.—*Pistacia Terebinthus* furnishes to Materia Medica its tanning galls and its oleoresin or Chio turpentine. Both leaves and galls are used for tanning and dyeing black. The seeds of *P. Terebinthus and P. atlantica* are sometimes eaten by the Arabs. From the latter species they collect turpentine in large quantity, and in Tunis a species of mastic, called *Huclc*, is obtained. From the bruised seeds, boiled, of *P. Lentiscus* the Arabs obtain an odoriferous oil, used for itch and rheumatism and also for food.

LEGUMINOSÆ.—Although *Melilotus officinalis* is not found in Algeria, it is advantageously replaced by numerous other species

rich in coumarin; among which may be named *M. macrocarpa*, the fruits of which are of the size of small peas, and are employed by the natives as antispasmodic and as spice.

Lathyrus sativus.—This vetch, much cultivated by the Kabyles, forms an important part of their food, and causes often veritable epidemics of medullary spasmodic lathyrism.

Duvernoy, in 1770, cited for the first time paralysis of the legs (Miller's Dict. of Gard.), also mentions as an effect rigidity of the limbs. Vilmorin, in 1853, in the *Bon Jardinier*, mentions many cases cited by La Houe & Deslandes. Prof. Bomlier, in 1882, also instances many cases of lathyrism in Kabyle. Lastly, Dr. Astier, of the School of Medicine, Algiers, presented a remarkable thesis on lathyrism (Lyon, 1883,) and isolated an alkaloid from the seeds.

Anthyllis vulneraria, *Lupinus albus*, *luteus*, *hirsutus* and *angustifolius* and *Vicia sativa*, more or less medicinal, are common in Algeria. Liquorice and the indigo plants are easily cultivated.

A large number of *Acacias* are cultivated, and the products of some are utilized, especially *A. Farnesiana*, commonly known as *Cassie*. The firm of Chiris & Gros use up annually 40,000 or 50,000 pounds of Cassie flowers for perfume. The Cassies and Sumas are of easy culture. The *Calabar bean*, lately sown in the botanic garden of the School of Medicine, thrives well, and so does *Soja hispida*, now recommended as a food for diabetic patients.

ROSACEÆ.—Of this family, but little used at present, may be mentioned *Spiræa Filipendula*, *Geum urbanum*, *Potentilla reptans*, *Cratægus Oxyacantha* and *Azarolus*. The root of *Fragaria vesca* is collected for pharmacy. *Rosa gallica*, like all the rose tribe, flourishes admirably in Algeria, but is seldom gathered. Rose water is made in small quantities. *Amygdalus communis* is found wild in many districts, but yields only bitter almonds. Its varieties are, however, cultivated. The kernels of the wild cherry, *Prunus avium*, are employed in Arab medicine; and the seeds of *Eriobotrya japonica* are very rich in amygdalin.

MYRTACEÆ.—*Myrtus communis* has astringent leaves and fruit, but they are little used. The Pimento of Jamaica has been introduced.

Eucalyptus Globulus, introduced by M. Ramel, is largely grown; but is now much superseded by *E. rostrata*, more hardy but much

inferior in its production of essential oil. About 4,500 pounds of oil of *E. globulus* is produced in Algeria, but this is insufficient to meet the demand. There are more than 120 species and varieties of Eucalyptus now grown in Algeria, and some, like *E. citriodora*, are capable of yielding agreeable essences.

Punica Granatum.—The pomegranate is much cultivated, and furnishes to Materia Medica the bark of its root and branches, its floral buttons, known as Balaustas, an acid juice and the astringent bark or peel of its fruits. The house of Legout & Peyron, of Algiers, alone export annually 5,000 to 7,000 pounds of pomegranate bark, employed either directly, or for the extraction of pelletierine.

LYTHRARIEÆ—*Lawsonia inermis.*—The henna leaves are much employed by the natives to color their nails and hair, as a vulnerary and a remedy for leprosy. There is an important commerce in henna in Algeria.

[*To be continued.*]

IMPROVED ASSAY OF CANTHARIDES.

The following process of assay is offered as being suitable for pharmacopœial purposes:

Moisten 10 grams of the drug, in moderately fine powder, with sufficient solution (10 per cent.) of sodium hydrate to render the mixture strongly alkaline, and digest six hours in a warm (130° F.) place until the mass becomes somewhat brittle; add dilute hydrochloric acid until a decided acid reaction is retained; again dry at a low temperature (about 130° F.) and pulverize; transfer to a modified Soxhlet extractor and exhaust the powder with hot chloroform by repercolation. (50 cc. $CHCl_3$ is sufficient.)

After three or four hours of percolation, evaporate or recover the chloroform by distillation from the flask; add CS_2; transfer the contents to a filter and continue to wash with CS_2 as long as it takes up soluble matter. Allow the filter to dry spontaneously; treat with hot chloroform, collect the filtrate and pass through a small quantity of purified charcoal, thoroughly washing with $CHCl_3$, and evaporate the chloroform solution in a tared capsule; dry the residue (crystals) in a warm place or over H_2SO_4 (cantharidin being volatile at 212° F.) to a constant weight and weigh as cantharidin. Yield 1 per cent. on an average.

J. B. NAGELVOORT.

THE GALENICAL PREPARATIONS OF THE ADDITIONS TO THE BRITISH PHARMACOPŒIA.

By the Editor.

In the following it is proposed to give, from the advance copy of the work received, the formulas for such galenical preparations as have now received official recognition in Great Britain, with such details of manipulation appearing desirable or necessary. It should be remembered that the British fluidounce differs from that of the U. S. P., in being the measure of 437½ grains, or 1 avoirdupois ounce of water.

Acetum Ipecacuanhæ.—Ipecacuanha, in No. 20 powder, 1 oz.; Diluted Acetic Acid sufficient to obtain, by maceration for 24 hours, followed by percolation, 20 fluidounces of the vinegar of ipecacuanha.

Adeps Lanæ hydrosus.—Woolfat (anhydrous), 7 oz.; Distilled Water, 3 oz. Melt the woolfat in a warm mortar, stirring in the water gradually and thoroughly.

Emplastrum Menthol.—Menthol, 2 oz.; Yellow Wax, 1 oz., Resin, 7 oz. Melt the wax and resin together, and as the mixture cools, stir in the menthol until dissolved.

Extractum Euonymi siccum.—Euonymus bark, in No. 20 powder; exhaust by percolation with a mixture of equal parts of rectified spirit and distilled water; distil or evaporate the spirit; incorporate with the still fluid extract so much sugar of milk—the actual amount having been ascertained experimentally—that the final product shall contain 80 per cent. of dry extractive; evaporate over a water-bath; powder, and keep in a well-corked bottle. Dry extract of euonymus is commonly known as "euonymin."

Extractum Hamamelidis liquidum.—Hamamelis leaves, in No. 40 powder, 20 oz. Prepare by percolation one pint (20 fluidounces) of fluid extract, using as menstruum a mixture of one volume of rectified spirit and two volumes of distilled water.

Extractum Hydrastis liquidum.—Hydrastis rhizome, in No. 60 powder, 20 oz. Prepare by percolation 20 fluidounces of fluid extract, using as menstruum a mixture of equal parts of rectified spirit and distilled water.

Liquor Cocainæ hydrochloratis.—Cocaine hydrochlorate, 33 grains

(or 100 parts); Salicylic Acid, ½ grain (or 1½ parts); Distilled Water sufficient to produce 6 fl. drachms (or 1,000 fluid parts). Boil the water, add the salicylic acid, and then the hydrochlorate of cocaine; cool, and add water, if necessary, to produce the required volume.

Liquor Morphinæ sulphatis.—Morphine Sulphate 35 grains (or 1 part); Rectified Spirit 2 fl. oz. (or 25 fl. parts); Distilled Water sufficient to produce 8 ounces (or 100 fl. parts). Dissolve.

Liquor Trinitrinæ.—Pure Nitroglycerin 1 part by weight; Rectified Spirit sufficient to produce 100 fl. parts. Dissolve.

Magnesii Sulphas effervescens.—Magnesium Sulphate, in crystals, 100 parts; Sodium Bicarbonate 72 parts; Tartaric Acid 38 parts; Citric Acid 25 parts; Refined Sugar 21 parts. The final product should weigh about 200 parts. Dry the magnesium sulphate at about 130° F. (54·4° C.) until it has lost nearly one-fourth (23 per cent.) of its weight; powder the product, mix with the sugar and then with the other ingredients, all in powder; heat the mixture to between 200° and 220° F. (93·3° and 104·4° C.), and when the particles begin to aggregate, stir them assiduously until they assume a granular form; then by means of suitable sieves, separate the granules of uniform and most convenient size, and preserve the preparation in well-closed bottles.

Mistura Olei Ricini.—Castor Oil 6 fl. drachms; Oil of Lemon 10 minims; Oil of Cloves 2 minims; Syrup 1½ fl. drachm; Solution of Potash 1 fl. drachm; Orangeflower Water sufficient to produce 2 fl. ounces. Mix the oils in a mortar; then incorporate one-third of the potash solution, afterwards the syrup, then an additional third of the potash solution, then gradually, half of the water, the remainder of the potash solution and lastly, sufficient of the orange-flower water.

Pilula Ferri.—Ferrous sulphate 60 gr.; Potassium Carbonate 36 gr.; Refined Sugar, in powder, 12 gr.; Tragacanth, in powder, 4 gr.; Glycerin 2½ minims; Distilled Water, sufficient. Reduce the ferrous salt to fine powder in a mortar, add the sugar and tragacanth, and mix intimately; finely powder the potassium salt in another mortar and incorporate it with the glycerin; transfer this mixture to the mortar containing the iron mixture, beat thoroughly

until the mass becomes green, adding water, if necessary to impart a pilular consistence, and divide into five-grain pills. The pills are known as Blaud's pills. Each pill contains about one grain of carbonate of iron.

Pulvis Sodæ Tartaratæ effervescens.—This is the Seidlitz powder, and differs from the formula of the U. S. P. only in the use of 38 (instead of 35) grains of tartaric acid for each powder.

Sodii Phosphas effervescens.—Sodium Phosphate, in crystals, 100 parts; Sodium Bicarbonate 100 parts; Tartaric Acid 54 parts; Citric Acid 36 parts. The final product should weigh about 200 parts. Dry the phosphate until it has lost rather more than half (60 per cent.) of its weight, powder, mix with the other ingredients, previously powdered, and granulate as directed above for effervescent magnesium sulphate.

Sodii Sulphas effervescens.—Prepared like the preceding, using sodium sulphate, in crystals, 100 parts, in the place of the phosphate, and drying it until it has lost about 56 per cent. of its weight.

Suppositoria Glycerini.—Gelatin, cut small, ½ oz.; Glycerin, by weight, 2½ oz.; Distilled Water sufficient. Place the gelatin in a weighed evaporating dish with sufficient water to cover it; after allowing it to stand a minute or two pour away the excess of water; set aside until the gelatin is quite soft; add the glycerin; dissolve over a water-bath, and evaporate until the mixture weighs 1,560 grains; pour the product into suppository moulds holding 30, 60 or 120 grain-measures, or having other capacities as required. Each suppository contains 70 per cent. by weight of glycerin.

Syrupus Ferri Subchloridi.—Iron Wire, 300 gr.; Hydrochloric Acid, 2 fl. oz.; Citric Acid, 10 gr.; Distilled Water, 10 fl. drachms; Syrup sufficient. Mix the hydrochloric acid with 1 oz. of water in a flask, add the iron wire, and apply heat gently until action ceases; remove the flask from the source of heat, add the citric acid, filter the solution through a small paper filter into 10 fl. ozs. of the syrup, pass the remainder of the water through the filter into the syrup, add sufficient syrup to make one pint (20 fl. oz.), and mix thoroughly.

Tinctura Hamamelidis.—Hamamelis Bark, in No. 20 powder, 2 oz.; Proof Spirit sufficient for preparing one pint (20 fl. oz.) of tincture by maceration and percolation.

Tinctura Hydrastis.—Hydrastis Rhizome, in No 60 powder, 2 oz.; Proof Spirit sufficient for preparing one pint (20 fl. oz.) of tincture by maceration and percolation.

Tinctura Strophanthi.—Strophanthus Seed, in No. 30 powder, and dried at 110° F. (43.3° C.), 1 oz.; Pure Ether and Rectified Spirit, of each sufficient. Moisten the powder with the ether, macerate for 24 hours, and percolate with ether until the fluid passes through colorless; dry the marc at 120° F. (48.9° C.), again reduce it to powder, moisten with spirit, macerate for 48 hours, percolate slowly with rectified spirit, until half a pint of tincture is obtained, and dilute this with rectified spirit to one pint (20 fl. oz.).

Trochisci Sulphuris.—Precipitated Sulphur, 36½ gr.; Acid Potassium Tartrate, 720 gr.; Refined Sugar, in powder, 5,760 gr.; Gum Acacia, in powder, 720 gr.; Tincture of Orange Peel, 720 minims; Mucilage of Acacia, 720 minims. Make into 720 lozenges.

Unguentum Conii.—Juice of Hemlock, 2 fl. oz.; Hydrous Wool-fat, ¾ oz.; Boric Acid, 10 gr. Evaporate the juice to 2 fluid drachms at a temperature not exceeding 140° F. (60° C.), add the boric acid and the wool-fat and mix thoroughly.

Unguentum Hamamelidis.—Liquid Extract of Hamamelis, 50 minims; Simple Ointment, 410 grains. Mix thoroughly.

POLARIZATION WITHOUT A POLARIZER.

To the Editor of the AMERICAN JOURNAL OF PHARMACY:

I have accidentally made a quite useful discovery, which I have not seen mentioned before. In order to *polarize*, we put a polarizer (Nicol) beneath the stage and an analyzer (Nicol) above the objective (either right next to it, at the end of the draw-tube, or above the eye-piece), the selenite comes on top of the polarizer. Now, I found that the polarizer is not absolutely indispensable. Given a certain polarizing condition of the sky (*i. e.* blue, with more or less watery vapor—as either before or after a rain, snow, or fog), you can polarize very nicely with the *analyzer alone*, and, if you want display of color, put the selenite on top of the slide, or anywhere convenient to you—so it comes beneath the analyzer. The colors (and crosses) will, of course, be somewhat fainter than when you use the polarizer too. In order to get the best display, it will be necessary to rotate both analyzer and selenite until in the proper

relative positions; or, to speak more correctly, the relative position of the P. A. of the selenite to the beam of light from the mirror decides the more or less intense coloration. With any other sky, the polarization is not observed.

This observation is useful in so far as to enable the possessors of microscopes, without substage facilities, to polarize fairly well—under the circumstances—and the proper condition of the sky is often obtained in our latitude. H. M. WILDER.

Philadelphia, November 20, 1890.

GLEANINGS FROM THE GERMAN JOURNALS.

BY FRANK X. MOERK, Ph.G.

Cholesterin.—Of the homologues and isomers of this compound occurring in the vegetable and animal kingdoms only the iso-cholesterin has been more closely studied and differences from cholesterin noted. To finally establish the formula of cholesterin, K. Obermüller made a series of derivatives from which the formula $C_{27}H_{45}OH$ follows. Of these compounds the propionate $C_{27}H_{45}C_3H_7O_2$ affords a means of distinguishing cholesterin from allied substances. The cholesterin is first separated from the fat or oil by evaporating the ethereal solution obtained by agitating the aqueous soap solutions with ether, or in the new method of saponification (AM. JOUR. PHARM., 1890, 490) evaporating at once the ethereal solution after the precipitation of the soap; a small quantity of this dried ethereal residue is melted in a dry test tube with 2 or 3 drops of propionic anhydride over a small flame. A very characteristic play of colors is produced if a small quantity of the cold fused mass is heated on a glass rod and allowed to cool, holding the rod in front of a dark background; first violet, gradually blue, green, dark gray, orange, carmine-red and, finally, copper-red. The blue and green colors continue for some time; by suddenly cooling the fused mass the copper-red color results lasting for some time. The blue color alone is obtainable if the cholesterin propionate be placed in a test tube and melted by immersion in a glycerin bath at 98° C. These colors are to be observed by reflected light, as by transmitted light the complementary colors are seen.

Cholesterin benzoate $C_{27}H_{45}C_7H_5O_2$ is easily obtainable by heating cholesterin to 160° C. for a few minutes, with a slight excess of benzoyl chloride; from an ether-alcoholic solution characteristic

tetragonal crystals are obtainable, melting at 145·5° C. Isocholesterin benzoate can also be made by the same method; this melts at 178·5° C.—*Ztschr. f. Physiol. Chemie*, 1891, 37–48.

A vegetable charcoal is now being made by carefully heating wood and allied substances with strongly alkaline solutions under great pressure; the product is equal, if not superior, and cheaper than charcoal obtained from blood. After use it can easily be regenerated by treatment with hydrochloric acid, ignition and thorough washing water. It has been very satisfactory in purifying and clarifying water, organic and pharmaceutical preparations, oils, honey, glycerin, ammonia, tannin, vaselin, alcohol, etc. In the examination of urine for sugar this vegetable charcoal will replace treatment with lead subacetate. Alkaline solutions containing more alkali than corresponds to 0·04 per cent. calcium oxide cannot be treated with this charcoal; ammonia solutions are exceptions to this. Odorous and bitter principles are removed by using it in excess, hence, in the presence of these, very little charcoal must be used, generally 1 or 1·5 parts in 1,000 is sufficient. Honey has been obtained almost colorless by using larger quantities, but it was devoid of aroma; by treating the dried charcoal with ether this can again be extracted and incorporated with the purified honey.—W. Müller, *Apoth. Ztg.*, 1890, 714.

Detection and estimation of nitrates in waters.—In 5 cc. of the water 2 centigrams sodium salicylate are dissolved, and 10 cc. colorless concentrated sulphuric acid gradually added so as to form a distinct layer; by gentle shaking, the two layers are mixed, a pale yellow to deep red color indicating the presence of nitrates. This color is then compared with that obtained by using dilute potassium nitrate solution of known strength, allowing the tests to become cold before comparing. A standard solution of potassium nitrate is made by dissolving 1·870 gm. pure and dried salt in one liter, this contains 1 part N_2O_5 in 1,000 parts; from this, solutions are made containing 1 part N_2O_5 in 5,000, 10,000, 20,000, 50,000 and 100,000 parts, respectively. These solutions are compared with the water to be examined. The limit of this test is one part N_2O_5 in 100,000 parts, indicated by a pale yellow color; these colors remain permanent for several days.—G. Looff, *Pharm. Centralhalle*, 1890, 700.

Examination of powdered spices.—As a preliminary examination, Borgmann recommends that one gram of the sample be agitated with 10 cc. water and the mixture poured upon an unglazed porcelain plate; the water is rapidly absorbed, leaving the isolated particles so that they can easily be examined with a magnifying glass.—*Pharm. Centralhalle*, 1890, 707.

Professor Koch's lymph.—L. Reuter, coming into possession of a few drops of this remarkable fluid, describes it as being transparent, of a pale brown color, completely soluble in water; the liquid is neutral; after acidifying with hydrochloric acid, auric chloride and solution of iodine in potassium iodide produce heavy precipitates; after acidifying with nitric acid, silver nitrate produces a white precipitate of silver chloride, soluble in ammonia. The indications are that the lymph is a neutral solution of the hydrochlorate of an alkaloidal body, possibly a ptomaine.—*Pharm. Ztg.*, 1890, 747.

Cytisine, the alkaloid of Cytisus Laburnum, had been given the formula $C_{20}H_{27}N_3O$ by Husemann and Marmé, but recent analyses of the double chlorides with platinum and gold give the formula $C_{11}H_{14}N_2O$ identical in composition with ulexine obtained from the seeds of Ulex europæus by Gerrard (see Am. Jour. Pharm., 1890, 454). The method of separating cytisine was as follows: The coarsely powdered seeds were extracted with alcohol containing HCl, the solvent distilled off, the residue dissolved in water and filtered through a wet filter to remove oil, the filtrate was freed from coloring matter by addition of lead acetate and filtration; after making alkaline with KOH the alkaloid was removed from the solution by agitating with amyl alcohol, which, in turn, was agitated with acidulated water; this latter solution on evaporation yielded the hydrochlorate. To remove the still adhering coloring matter, cold absolute alcohol was used, and the salt recrystallized from aqueous solution.—Dr. A. Partheil, *Apoth. Ztg.*, 1890, 691.

Larixolin is the name given to a patented imitation of French turpentine oil; it is a mixture of 2 parts of a petroleum fraction (specific gravity 0·8224 at 15° C.) and one part camphor oil (specific gravity 0·9149). The odor and specific gravity are those of the natural oil, the flash test is obtained at 55° C., while in the natural oil this is at 45° C.—L. Reisberger, *Pharm. Centralhalle*, 1890, 669.

To remove rust from iron or steel utensils, the following solution

is applied by means of a brush after having removed any grease by rubbing with a clean, dry cloth: 100 gm. stannic chloride are dissolved in one liter water, this solution is next added to one containing 2·5 gm. tartaric acid dissolved in one liter water, and, finally, adding 20 cc. indigo solution diluted with two liters of water. After allowing the solution to act upon the stain for a few seconds, it is rubbed clean with first a moist cloth, later with a dry cloth; to restore the polish, use is made of silver sand.—Patent of A. Bücher, *Pharm. Centralhalle*, 1890, 672.

Piperazidine, $C_4H_{10}N_2$ (prepared synthetically by Die Chem. Fabrik auf Actien, formerly E. Schering), identical in composition with *spermine*, has not proven identical in physiological action. It, however, possesses the property of dissolving large quantities of urates, and is likely to be of service in dissolving urate concretions if applied subcutaneously. Its solvent power for uric acid exceeds twelve times that of lithium carbonate and it has the advantages of being soluble in almost all proportions of water, and not poisonous or caustic.—*Pharm. Centralhalle*, 1890, 714.

The iodine test for peppermint oil of the German and Russian pharmacopœias, in which an adulteration with turpentine oil is indicated by a rise in temperature or by slight detonation, has been examined by E. Hirschsohn, who finds that all peppermint oils produce with iodine an increase in temperature, and that to cause detonation at least 40 per cent. turpentine oil would have to be present, smaller quantities not being indicated.—*Pharm. Ztschr. f. Russland*, 1890, 708.

A good soap for removing stains can be made, according to the *Pharm. Zeitung*, by rubbing together 30 parts each of borax and quillaia extract (made by exhausting the ground bark with boiling water and evaporating to syrupy consistence; 100 parts bark usually yield 20 parts extract) and adding 120 parts fresh ox-gall; this mixture is then incorporated with 450 parts melted soap and the mass poured into suitable containers.

Extractum cinchonæ liquidum.—M. C. Traub, in the *Schweizerische Wochenschrift für Pharmacie*, 1890, 377, publishes an improved method for making this extract proposed by De Vrij, which consists in macerating for two days the powdered cinchona

bark (100 parts) with a mixture of 10 parts glycerin, 10 parts hydrochloric acid and 200 parts water, then percolating, finishing with water until the percolate ceases to precipitate with sodium hydrate. The percolate is next distilled in a vacuum of 700 mm., at a temperature not exceeding 40° C. (this is regulated by placing the retort in a water-bath kept at 45° C.) until a syrupy liquid remains in the retort; this is removed to a tared vessel, the retort being rinsed with successive small portions of water until the total liquid weighs 90 grams; then 10 gm. alcohol are added, and the extract filtered. By the above process, change in the bark constituents is avoided and an extract obtained only slightly darker in color than the bark used. A temperature of 65°–70° C., even in a vacuum, is sufficient to bring about decomposition of the cinchotannic acid.

The distillation of cassia oil to detect addition of resin, if not properly carried out, may lead to the condemning of a pure oil; if in the distillation the retort be exposed so that the atmosphere cools the upper portion, the distillation proceeds slowly, and as much as *sixty* per cent. residue is obtainable; but if the retort be surrounded by some non-conducting material, like asbestos, the distillation is rapid and only *five* per cent. residue is obtained from the same oil. The residue in the first case has all the characteristics of asphalt: solubility, odor, color; while in the distillate are found water, acetic acid, phenol and hydrocarbons. These results would indicate that the asphalt found in nature was produced by the action of heat and, probably, pressure upon essential oils or resins.—E. Hirschsohn, *Pharm. Ztchr. f. Russl.*, 1890, 692.

A METHOD OF SOAP ANALYSIS.

By Dr. T. Pinette.

The following method embodies a simplification of the usual process of soap analysis. It requires a separating funnel, such as is used by B. Rose in his method for the estimation of the fat in milk. This is provided with a stopper and tap, holds about 230 cc., and is graduated up to 200 in half cc. Such a funnel is useful for many purposes, and should certainly be employed. The analysis is carried out by dissolving 2 gm. of soap in boiling alcohol free from acid; if any matter is left undissolved, it should be filtered off and examined. A few drops of phenolphthalein solution are then added, and,

if any red coloration is produced, the free alkali determined by decinormal sulphuric acid. The neutralized liquid is diluted with water to about 80 cc., and transferred to the separating funnel. As soon as the liquid has cooled to the temperature of the air exactly 10 cc. of normal sulphuric acid are added, and the funnel filled up to the 200 cc. mark with a mixture of equal parts of ether and light petroleum. The moistened glass stopper is then inserted, fastened down with string, and the whole vigorously shaken until the fatty acids have completely dissolved. After allowing the funnel to stand for some time, the volumes of the aqueous solution and the ethereal solution are read off.

To determine the fatty acids, 25 cc. of the ethereal solution are removed by a pipette to a weighed basin, the liquid evaporated, and the residue dried and weighed. It can then be further examined if required; e. g., it may be dissolved in alcohol, and the saponification equivalent determined by titration.

The alkali, combined with the fatty acids, is estimated by drawing off the acid aqueous solution by means of the tap, and determining the excess of sulphuric acid in 25 cc. by titration with decinormal caustic soda. All the data are then obtained for the calculation of the alkali. The potassium and sodium may be separately determined by evaporating the neutral solution in which the alkali has been determined, heating to redness and weighing. As the sulphuric acid in the mixture is known, the potassium and sodium present can easily be calculated. The amount of soda added in titrating the excess of sulphuric acid must, of course, be subtracted from that found, in order to give the quantity present in the soap.

The advantages of this process are mainly that it avoids the wearisome washing and filtering of the fatty acids, that at least three determinations can be made of fatty acid and alkali in the same sample, and that if required portions of the liquid may be submitted to further examination.—*Chemical Trade Journal.*

THE TOXIC ACTION OF URANIUM.[1]

In view of the recent discovery of uranium deposits in Cornwall and the large reduction in price, and the consequent endeavor to find useful applications for the metal and its salts, it is well to be alive to

[1] From the *Pharmaceutical Journal and Tra* *ns*, Sept. 13, 1890.

the fact, of no great importance whilst the use of uranium salts was confined to the chemist and technologist, that the substance in question is one of the most powerful of the metallic poisons. Although this fact has been known for years, it has been somewhat overlooked in much the same way as the extreme toxicity of barium salts has been little insisted on, and the researches of Woroschilsky, chronicled in the *Chemiker Zeitung*, are especially *apropos* at this time.

Our knowledge of uranium dates from its discovery in Bohemian pitch-blende by Klaproth, about a hundred years ago, but the first investigation of the physiological action of its salts appears to have been made in 1824 by Gmelin, who mentions its poisonous character. Leconte, in 1851, confirmed this assertion, and added that one of the most characteristic symptoms of poisoning by uranium was the occurrence of large quantities of sugar in the urine, whereupon homœopathists jumped to the conclusion that it must be a specific for diabetes. Woroschilsky's experiments show that sugar certainly appears in the urine after the administration of uranium salts by the mouth, or by subcutaneous injection. As the net result of eight experiments with the nitrate, he agrees with the conclusion of Leconte and Chittenden that it is intensely poisonous. But neither the nitrate nor the acetate is well suited for physiological investigations, as both salts coagulate albumen, even when diluted in the proportion of 1 : 10000. Further experiments were, therefore, instituted with the double tartrate of uranium and sodium, which is both readily soluble and does not precipitate albumen. It may be prepared by neutralizing a solution of 10 grams of pure uranic oxide (UO_3) in 300 cc. of a 4 per cent. solution of tartaric acid, with caustic soda, and diluting to 400 cc. The resulting brown-yellow clear liquid is stable if kept from light; it yields, on evaporation, a glassy, amorphous mass, no crystalline double salt being formed. The double tartrate gives with potassium ferrocyanide a deep brown coloration instead of the usual precipitate yielded by ordinary uranium salts, and with ammonium sulphide, after standing a moment, an intensely yellow precipitate, which is soluble in ammonium carbonate.

The physiological action of this salt, exhibited in various ways, was studied in the case of worms, frogs, birds and mammals. It was found that whether absorbed through the mucous membrane of the stomach, or introduced by subcutaneous injection, it is powerfully

poisonous. Subcutaneous doses of 0·5–2·0 milligrams per kilo of body weight cause death with all the symptoms of acute poisoning. It is noteworthy that very small doses administered subcutaneously are almost as quickly fatal as are considerably larger quantities, the only difference being that the action of the latter on the organs affected is more marked. It is remarkable that during the first day or two after the administration of the poison there is no outward evidence of its effects save the pathological character of the urine, although afterwards the toxic action is increasingly manifest, so that the whole nature of the poisoning may be said to be of a subcutaneous character.

The exact symptoms produced by poisonous doses of uranium are as follows: Severe gastro-enteritis follows its administration, while nephritis is induced by such small doses as 1–2 milligrams per kilo of body weight. It is distinguished from other metallic poisons by acting directly, even in very small doses, on the walls of the blood-vessels. This tendency is doubtless closely connected with its specific action on the blood by causing the hæmoglobin to retain oxygen altogether abnormally, in which respect it resembles hydrocyanic acid. A knowledge of this fact throws considerable light on the phenomena attending poisoning by uranium. On its introduction into the circulation, the difficultly-reducible oxyhæmoglobin, resulting from its action above mentioned, probably affects the walls of the blood-vessels in the same manner as venous blood and causes their dilatation. The failure of the oxyhæmoglobin under the influence of uranium salts to part normally with its oxygen accounts also for the profound disorganization of the nutritive functions which ensues, and for the derangement of the nervous system, liver and kidneys, which accompanies it. It also explains the general waste of tissue, resulting in the emaciation of the animal under experiment, which was a characteristic symptom, and further elucidates the first noted pathological phenomenon, viz: the appearance of sugar in the urine, which is merely a sign of imperfect oxidation in the circulatory system, disappearing with the removal of the ultimate cause. Professor Kobert has recommended, on account of their extreme toxicity, the insertion of the soluble salts of uranium in the list of poisons officially current in Russia, and it is certainly desirable that other countries should make a similar move.

ON THE ACTION OF MORPHINE AND ITS DERIVATIVES.[1]

By D. J. Leach.

The paper of Dr. Stockman and Mr. Dott is an important contribution to our knowledge of the influence of chemical change on physiological action as well as to the pharmacology of morphine.

Recent researches have indicated that morphine ($C_{17}H_{19}NO_3$) contains two hydroxyl (OH) groups, and its formula is often written C_{17} H_{17} NO OH OH, though many points with regard to its exact constitution yet remain to be determined. It has been shown, too, that certain of the hydrogen atoms can be replaced by more or less complex radicles (CH_3,C_2H_3O, etc.), the hydrogen atoms of the hydroxyl groups being most easily replaced, and one of them more easily than the other. New bodies can likewise be formed by adding radicles to the morphine molecule itself.

It is manifest that the difference between the physiological action of morphine and the new compounds formed by substituting radicles for hydrogen elements in the morphine molecule or by adding radicles to the molecule itself will give a clue to the physiological influence of these radicles.

Stockman and Dott have prepared a large number of new substances both by substitution and addition of radicles, and compared their physiological effects with that of morphine; in the present paper they give a summary of their results. The details of the experiments have been communicated to the Royal Society of Edinburgh.

The authors first give their views concerning the action of morphine.

It is well known that morphine primarily affects the nervous system. If small doses (2 to 5 cg.) of a soluble morphine salt be injected into a frog, there is first narcosis and depression of the junction of the spinal cord, but in about an hour the reflexes are exaggerated and tetanic spasms occur. It has been assumed that

[1] *The Medical Chronicle*, Novbr., pp. 138–143; an abstract prepared from two papers by R. Stockman and D. B. Dott, on The Pharmacology of Morphine and its Derivatives (*Brit. Med. Journ.*, July 26, 1890); and by E. Tauber, on The Fate of Morphine in the Animal Organism (Ueber das Schicksal des Morphins im thierischen Organismus. *Archiv für Experimentelle Pathologie und Pharmakologie*, July 24, 1890).

morphine first depresses and then stimulates the cord, but the experiments of Stockman and Dott lead them to the conclusion that this view is erroneous. Morphine they hold in small doses depresses the action of the cord; in larger doses stimulates it. The late appearance of increased reflexes is they think due to the fact that at first only a small quantity of morphine reaches the cord. It has been held by some observers that morphine is capable of directly paralyzing the motor endings of nerves, but Witkowski considered that the depressed excitability of the motor endings was the result of the exhaustion consequent on the prolonged tetanus caused by morphine. Stockman and Dott record experiments tending to show that morphine does paralyze more or less completely the nerve endings, but only when large amounts come into contact with them. The end organs, however, are certainly not very sensitive to the action of morphine. With sensory nerves the state of affairs seems to be much the same. Mammals are affected by morphine like frogs, but die so soon from paralysis of the respiratory centre that the tetanic stage is not usually well developed. In man tetanic symptoms are very exceptional, for after therapeutic doses the amount of morphine reaching the peripheral nerve endings is not usually sufficient to affect them.

After thus setting forth the physiological action of morphine, the authors proceed to compare with it the influence of groups of new compounds which they prepared from morphine by substitution and addition.

Substitution of alkyls.—Three compounds were produced by the replacement of an atom of hydrogen in morphine by an atom of methyl, ethyl, and amyl, respectively, viz:

Methyl morphine,	$C_{17}H_{18}NO_2OCH_3$
Ethyl morphine,	$C_{17}H_{18}NO_2OC_2H_5$
Amyl morphine,	$C_{17}H_{18}NO_2OC_5H_{11}$

Chemically these substances may be looked upon as the methyl, ethyl, and amyl ethers of morphine. The first of the three is the well-known alkaloid codeine. Comparing the physiological effects of these three substances with that of morphine, it was found that in all the narcotic action was much diminished by the substitution of the alkyl radicle for the hydrogen atom, whilst the tetanic action and the action on the motor nerves was increased. The paralyzing action, too, on the motor nerve endings was more decided. The

lethal dose of these compounds was found to be smaller, owing to their increased tendency to cause convulsions. The action of all three substances was practically identical; they all affect the same parts of the central nervous system as morphine, though they do not influence these parts in the same degree. It would seem that if the same atom of hydrogen be replaced, it does not matter which alkyl radicle is substituted, though it is possible that further investigations may indicate some quantitative difference so far as regards their action on the different parts of the nervous system.

Substitution of acid radicles.—Four compounds were prepared in which one or two equivalents of hydrogen were replaced by acetyl or benzoyl, viz:

Acetylmorphine,	$C_{17}H_{18}(C_2H_3O)NO_3$
Diacetylmorphine,	$C_{17}H_{17}(C_2H_3O)_2NO_3$
Benzoylmorphine,	$C_{17}H_{18}(C_7H_5O)NO_3$
Dibenzoylmorphine,	$C_{17}H_{17}(C_7H_5O)_2NO_3$

The substances thus produced have almost identical physiological effects. It seemed quite indifferent which acid radicle was introduced, and whether one or both hydrogen atoms were replaced. The tetanizing power of all four was much greater than that of morphine, their narcotic action distinctly less. The depressant action of small doses on the cord and on the respiratory centre is very much greater than that of morphine. Compared with codeine they produce an equal narcotic effect with about one-tenth the dose, whilst about three times larger dose is necessary to cause tetanus; their depressant action on motor nerves is about the same. Acetylmorphine affects the heart more than codeine.

Substitution of chlorine.—Compounds were produced by substituting chlorine for the atoms of hydrogen in morphine and codeine.

In *trichloromorphide* $C_{17}H_{16}Cl_3NO$ both the hydroxyl groups and one hydrogen atom have been replaced by three atoms of chlorine. The new alkaloid acts primarily on the central nervous system, and causes depression, followed by tetanus. It has a marked paralyzing action on the motor nerves, and has some slight action as a muscle poison.

In *chlorocodide* $C_{18}H_2ClNO_3$ a hydroxyl group in codeine has been replaced by chlorine. Chlorocodide causes narcotic and tetanic symptoms in frogs to much the same degree as codeine. Its action

on motor nerves is, however, more marked, and it is distinctly a muscle poison.

It will be noted that the introduction of chlorine into the morphine and codeine molecules gives them a paralyzing influence on muscle tissue not possessed by the unaltered molecules.

Substitution of NO and HSO_3.—Morphine sulphuric acid $C_{17}H_{18}NO_3HSO_3$ and nitrosomorphine $C_{17}H_{18}(NO)NO_3$ have much the same physiological action as the substances produced by the introduction into the morphine molecule of alkyls or acid radicles. The sulphuric compound is less toxic than codeine.

Addition of radicles to the morphine and codeine molecules.—Experiments made with *methylmorphium chloride* $C_{17}H_{19}NO_3CH_3Cl$ and *methylcodeium sulphate* $(C_{18}H_{20}NO_3CH_3)_2SO_4$ show that the addition of chloride and sulphate of methyl to morphine and codeine respectively alters but little the action of these alkaloids. The paralyzing influence on motor nerves is considerably increased, but qualitatively the effects on the animal organism remain similar to those of codeine or morphine. The conclusions arrived at by Stockman and Dott with regard to the action of these two substances are not quite in accord with the results of earlier observers.

Crum, Brown and Fraser, in their well-known investigations concerning the relation between chemical composition and physiological action, found that a methylmorphium salt was hypnotic and paralyzed the termination of motor nerves, but had no convulsant action, whilst methylcodeium sulphate was neither hypnotic nor convulsant, but a paralysant of the terminations of motor nerves.

Stockman and Dott find that the methylmorphium chloride does stimulate the spinal cord, but the paralysis of motor nerves obscures the spasmodic symptoms, and that methylcodeium sulphate acts slightly as a narcotic, and like codeine, in small doses depresses, and in large doses stimulates the spinal cord. The paralysant effect on the motor nerve endings hides to some extent its stimulant effect on the spinal cord.

Methocodeine $C_{17}H_{17}NO_22(CH_3)$.—In this body two methyl molecules have been introduced into morphine. One of these replaces a hydroxyl atom, while the other is introduced into the body of the morphine molecule $C_{17}H_{17}(CH_3)NO\ OH\ CH_3$. By this substitution a great change in physiological effects is produced. Methocodeine has neither narcotic nor tetanizing effect. It is a

poison of voluntary muscle, and to some extent depresses the functions of the spinal cord.

Stockman and Dott conclude from their researches that so far as morphine is concerned, chemical changes restricted to what may be called the outlying groups of the molecules cause very little change in the physiological action, but when a change is made in the kernel or groundwork of the molecule the action is much more profoundly altered. To determine the exact influence of the molecules under varying conditions, will, of course, require an extensive series of similar observations on many other substances.

Dr. Tauber, in his paper on the fate of morphine in the animal organism, gives a résumé of the investigations already published concerning the excretion of morphia, and adds some experiments of his own made for the purpose of ascertaining what becomes of morphine after it has been absorbed. He points out that whilst some observers have found morphine in the urine of men and lower animals after its administration by the mouth and subcutaneously, others have been unable to detect its presence in this secretion, and that of those who have detected it in the urine, only one professed himself able to recover morphine from the urine, and even his success was open to question. No one has so far succeeded in obtaining it from the blood after absorption. He holds the discovery of the traces of morphine in the urine by the color test after its absorption is no proof that the kidney is the special seat of its excretion, since a color test such as Fröhde's is so delicate that it detects $\frac{1}{1300}$ of a grain. Any definite quantity of morphine in the urine should be easily separated, for he records experiments that even from blood 95 per cent. of morphia mixed with it can be recovered. Some have thought it probable that morphia is destroyed in the body. Eliassow found in the urine, after small doses of morphia, a substance, probably the product of the metamorphosis of morphine, which does not give the same color test as morphine with Fröhde's and Husemann's reactions.

After large doses he noticed an increase in the paired sulphuric acid of the urine and also in the excretion of ammonia. Berkhart, too, in chronic morphine poisoning found in the urine a substance which gave with Fröhde's test a color differing from that produced by morphine, and Marmé a substance which he thought gave the reaction of oxidi-morphine in the stools, blood, liver, lung and kidneys.

If morphine be destroyed in the organism, its destruction would probably occur, Tauber says, in the liver, kidneys or blood. In order to ascertain whether such destruction takes place, he passed blood containing a definite quantity of morphine through excised but living organs after the manner employed by Schmiedeberg and Bungé, but in neither the liver nor the kidneys of the pig could he find evidence that any destruction of morphine occurred.

The amount of morphine in the blood passed through was not materially decreased, nor was it in any way destroyed, according to Tauber, in blood arterialized by the passage through it of air. As there is no evidence that any considerable quantity of morphine is destroyed in the system or excreted by the urine, it seemed to Tauber probable that morphine might be excreted through the bowels.

Alt has already pointed out that after injection subcutaneously morphine could be detected in the stomach, and Vogt, after subcutaneous injections of morphine found a considerable quantity of the alkaloid in the fæces.

Tauber gives an experiment which seems to show that a considerable quantity of morphine taken into the organism is excreted by the bowels. He injected during ten consecutive days small quantities of morphine into a dog; altogether, the animal received about thirty-two grains, and he succeeded in recovering from the fæces 41·3 per cent. of the morphia. This latest contribution, then, concerning the fate of morphine in the animal organism, points to the intestinal tract rather than the kidneys as the seat of the excretion of this alkaloid.

LEAVES OF STRYCHNOS NUX-VOMICA.

By David Hooper.

The leaves of the nux-vomica plant are little used in Indian medicine, as the seeds, on account of their abundance and the facility of collection, are the best known of its products. The bark, wood and roots of this and other species of *Strychnos* are occasionally administered as tonics and febrifuges. The leaves are made into a decoction and applied externally in paralysis and in rheumatic swellings of the joints. The juice of the leaves has been given for the relief of headaches. They have also been known to make very effectual leaf-poultices for tumors and sprains; in fact, in India leaf-poultices are made from very numerous and widely distributed plants.

The poisonous nature of the leaves has never to my knowledge been investigated, but being informed of some suspected cases of poisoning of animals from their use as fodder, I considered this a sufficient reason for prosecuting an inquiry into the subject. Mr. J. Cameron, F.L.S., Bangalore, about a month ago asked if fresh nux-vomica was known to be poisonous, informing me at the same time that a gentleman residing near him had lost three horses from, it was supposed, their eating the leaves of the tree. Another case was that of a cow dying under suspicious circumstances, and nux-vomica trees were growing in the compound where she was in the habit of grazing. "The cow had convulsions, bled at the mouth and nostrils, and only lived for a short time from the commencement of the attack." Mr. J. F. Duthie has drawn up a list of Indian fodder-yielding trees, shrubs and herbs, including certain bitter leaves and branches of the Simarubeæ and Meliaceæ, but no mention is made of any species of *Strychnos* affording edible foliage.

The leaves forwarded from Bangalore were very variable in size, the largest being 4½ in. (113 mm.) by 2¾ in. (63 mm.), and the smallest 2¾ in. (63 mm.) by 1¾ in. (46 mm.), petiole from ¼ to ½ in., oval or oval-rotundate, rounded or somewhat tapering at the base, acute at the apex or abnormally rounded, entire, thick, smooth, shining on both sides, mostly three- rarely five-nerved from the base, only the midrib reaching the apex. The leaves when dried made a dark green powder having an acidulous and bitter taste.

A preliminary examination for alkaloid in the aqueous solution of an alcoholic extract gave abundant evidence of its presence by giving precipitates with tannin, potassio-mercuric iodide, and iodine and bromine solutions. The alkaloid did not answer to strychnine when the sulphuric acid and bichromate of potassium test was applied, but afforded the reaction of brucine by turning a vivid red color with nitric acid. It was found that cold alcohol was insufficient of itself to dissolve out the whole of the alkaloid, for after percolating until all the chlorophyll and soluble substances had been removed the marc was still bitter. Alcohol dissolved out 0·315 per cent. of alkaloid calculated as brucine. Chloroform with 25 per cent. of alcohol, boiled with the leaves for one hour, the process adopted by Messrs. Dunstan and Short for extracting the seeds, proved to be very satisfactory in exhausting the alkaloid, as the resulting extract contained more of the base and the marc was free from bitterness.

Five grams of the powdered leaves were exhausted with boiling chloroform and alcohol for one hour, using a reflux condenser. The extract evaporated to dryness was heated with water acidulated with sulphuric acid, and when cold was filtered and the filter washed. The light colored liquor was treated with freshly prepared Mayer's reagent (1 cc. indicating 0·0197 gram of anhydrous brucine) and required 0·9 cc. for complete precipitation, equivalent to 0·354 per cent. of brucine.

The estimation was repeated, and exactly the same amount of Mayer's reagent was required to precipitate the alkaloid from the acid solution obtained from 5 grams of the leaves. The precipitates were collected on a filter, washed, dried and weighed together. Calculating from the formula of the brucine iodide with mercury iodide, $C_{23}H_{26}N_2O_4HI$, HgI_2, containing 40·37 per cent. of brucine, the united precipitates from the 10 grams of leaves showed the presence of 0·368 per cent. of alkaloid.

A larger quantity of the leaves was worked up for alkaloid, and the residue, purified by chloroform, was converted into acid sulphate, and its solution treated with ferrocyanide of potassium, as described in Messrs. Dunstan and Short's method for separating strychnine and brucine. The very slight precipitate that fell was not characteristic of strychnine ferrocyanide, and upon testing it further with sulphuric acid and potassium bichromate, the violet color was not developed. A neutral solution of the alkaloid was tested with potassium chromate, but no precipitate appeared until the liquor was concentrated, and the precipitate gave no color reaction with the oxidizing mixture. Wynter Blyth considers potassium chromate a very delicate test for strychnine. On the other hand, the alkaloid obtained from the leaves responded to the more important reactions of brucine. The action of nitric acid was specially studied, and among the products were detected crystals of kakotelin, and the mother liquor contained oxalic acid.

Other constituents of nux-vomica leaves are an acid resin soluble in spirit and aqueous alkalies, and dissolved by sulphuric acid with a green color changing to reddish-brown, and a caoutchouc-like substance dissolved by benzol, but not by spirit or alkalies. An organic acid, probably the strychnic or igasuric acid of older writers, is associated with the alkaloid in both the alcoholic and aqueous extracts. It strikes a green color with ferric chloride, and is

removed from solution by neutral plumbic acetate. Crystals of a body which might be referred to loganin separated from the hot chloroform-alcohol extract, but I could not obtain much more than a trace of this body from the alcoholic extract after the removal of other substances by ether. The dried leaves afforded 11·86 per cent. of ash.

From these experiments it is evident that the alkaloid of nux-vomica leaves is brucine, and that no strychnine could be separated. The bark of nux-vomica has been analyzed by Shenstone, Dragendorff and Greenish, and the alkaloid from this source was shown to be mainly brucine, with a very small proportion of strychnine mixed with it. As brucine has the same physiological effects as strychnine in inducing well-marked tetanic symptoms, the leaves of nux-vomica taken in sufficient quantity would produce poisonous results. Compared with the seeds, the leaves contain about one-tenth the amount of total alkaloid, but, notwithstanding the smaller proportion of brucine present, the leaves would be highly injurious as fodder, and precautions should be taken in keeping cattle from feeding upon them.—*Phar. Jour. and Trans.*, Dec. 6, 1890, p. 493.

SOME NOTES ON NATAL ALOES.[1]

By J. Medley Wood.

As the Director of Kew Gardens, and also Mr. Holmes, of the Pharmaceutical Society's Museum, had expressed a wish for information as to the plant from which Natal aloes had been made, and for any information I could obtain on the subject, I decided to relinquish the idea of proceeding to Drakensburg for my annual botanizing trip, and to visit the neighborhood of Greytown instead. From this place some years ago the drug was exported in quantity, but at the present time its manufacture appears to be quite discontinued, and not a single person was engaged in it through the whole district, as far as I could learn. I was also informed before leaving Durban that the aloe plants would be in flower about the middle of April, later than which I could not defer my journey. This information, however, proved incorrect, as I could not find a single plant either in flower or bud, though I searched carefully, and residents in the neighborhood informed me that the flowers would not appear

[1] From the Kew *Bulletin*, August; reprinted from *Phar. Jour. and Trans.*, Dec. 6, 1890, p. 495.

before July. Mr. Newmarch, Jr., who has been engaged in the manufacture of the drug, very kindly accompanied me to the "Thorns," and pointed out places where the manufacture had been carried on, the whole country, both on the level ground and far up the hill-sides, being thickly covered with the plants, so thickly, that making our way between them on horseback was often a matter of difficulty. The average height of the mature stem was 8 to 10 feet, but Mr. Newmarch informed me that they are frequently met with from 15 to 20 feet high. As to the species, it is undoubtedly the one which has always been known to me as *A. ferox*, with perhaps a few of the variety *subferox*, and in the district which I visited it is quite certain that no other species has been used in the manufacture. Mr. Newmarch, Jr., however, informed me that across the Mooi River, and in the direction of Weenen, another species is found in moderate quantity, and its leaves have been used, but whether alone or mixed with those of *A. ferox* I am unable to say; we were not, however, able to find even a single specimen of this plant, and the time at my disposal would not allow of my visiting the Weenen country on this occasion. The plant was described to me as being equal to *A. ferox* in size, the leaves light green or glaucous, prickly on the edge, but without any prickles on either surface, and the flowers red. I regret very much not having been able to meet with it. I forward by the kindness of Mr. Newmarch, Sr., a small specimen of the drug, made about two years ago, from the plants which I saw, and which is certainly unmixed with the juice of any other species than the one known to me as *A. ferox*, the sample being taken from a full box opened by Mr. Newmarch for the purpose. Mr. Newmarch pointed out to me in his garden another species which he believed had been sometimes used, and which was said to yield a lighter colored juice; but other persons said that they had never seen or heard of its being used, nor is it at all plentiful in the district where the drug is made, seeming to prefer the tops of the hills, while *A. ferox* is more plentiful in the valleys and along the hill-sides. I send a photograph of a plant of this species taken in the Botanic Gardens, and plants or cuttings can be sent at any time desired. I think, however, that its leaves have not been used, except perhaps accidentally. The process of manufacture as described to me by Mr. Newmarch, Sr., is as follows: Each workman is provided with a stout leather glove for the left hand, a cut-

lass or bill-hook, and a trough similar to a pig-trough, made of 6-inch board, with square ends so as to stand level, and having on each side a rail at a sufficient height from the top of the trough to support the ends of the leaves. As the leaves are cut the workman places them on each side of the trough, with the cut end downwards, and lays one row over the other, until the trough is full. He then fills in the same manner a second and a third trough, by which time the leaves in the first are sufficiently drained of their juice, and are taken off and thrown away, the juice in the trough being then emptied into a bucket. A good hand will collect about a bucketful of juice each day. I was also informed that those plants which were most covered with prickles were considered to be the best, as they were thought to yield more juice than the others. When sufficient juice is collected it is placed in an iron pot or boiler. Mr. Newmarch used an iron boiler holding about 100 gallons, which rested upon brickwork, and was provided with a chain and lever, by means of which it could be quickly lifted from the fire and swung aside when the juice was sufficiently cooked. As soon as the fire is lighted the attendant commences to stir the juice, which at first adheres both to the stirring stick and to the sides of the pot, but after half an hour to an hour's boiling the juice becomes thicker, until when it leaves the sides of the pot quite clean it is considered to be sufficiently cooked, and is quickly lifted from the fire and at once poured into the box, where it is left to cool before being screwed down for export. Mr. Newmarch also informed me that much carelessness has been shown in the manufacture; some in consequence of not having sufficient hands employed, leaving the juice too long in the iron pots before boiling; some have boiled too much and others too little, and he has seen boxes being carted away with the juice dripping through the joints of the boxes. He also informed me that the manufacture has been carried on at all seasons of the year, the yield of juice being greater during the summer months, but requiring more boiling. If it would be any advantage to you to have plants of the species alluded to here as *A. ferox*, from which the sample of the drug sent has been made, and which is undoubtedly identical with the plant growing in the Botanic Gardens here, and represented in *Gardeners' Chronicle*, vol. v., p. 113, fig. 14, I shall have much pleasure in obtaining for you, either small plants or a moderately-sized trunk, whichever you may

prefer, and I shall also try to obtain specimens of flowers for the Herbarium.

In conclusion, I may say that I noticed at least two species of dwarf aloe intermixed with the large plants of *A. ferox*. One of these is common all over the colony, the other I had not previously noticed, and I was unable to identify either. All accounts, however, agree that the leaves of these species are never taken, nor would it pay to do so, as they would require some searching for, while *A. ferox* abounds in every direction. Their leaves also are few, and comparatively small, and would not be worth the trouble of collecting.

BENZOIN.

By E. M. Holmes, F.L.S.

The specimen of Palembang benzoin, sent by Dr. M. Treub (Director of the Government Botanic Gardens in Java) to the British Pharmaceutical Society, is scarcely a typical sample of the product as met with under that name in the London market. It has lost the opalescent translucency on the outer surface, but has the same lustrous fracture as Palembang benzoin, although darker in color, as if it had been kept and exposed to the light for some time. It contains two or three white angular tears like those of Siamese benzoin, but the latter do not show any evidence of exposure to light.

The interesting point about Palembang benzoin is, that while it has the same odor as ordinary "Sumatra" benzoin, it is more translucent and appears to contain a considerable amount of moisture, freshly broken specimens readily becoming mouldy when placed in a closed glass vessel. So far as I have been able to learn only one species of benzoin tree is commonly known at Palembang, and that, judging from specimens presented to the Society's Herbarium by Mr. R. Jamie, in 1883, is undoubtedly *Styrax Benzoin*, Dry., as well as from the specimens from Java sent by Dr. Treub, since they have the globular fruits characteristic of that species. If the Palembang and Sumatra bezoins of commerce are derived from the same tree, there is probably some difference in the mode of preparation; the Palembang variety may, perhaps, be melted into blocks in hot water, and the Sumatra by artificial heat; and this might account for the moisture present in the former and the larger percentage of benzoic acid that it generally affords, but I have not been able to learn any

facts tending to confirm this suggestion. The specimen of benzoin sent by Dr. Treub has the same odor as the Palembang and the ordinary Sumatra benzoin.

The odor of the Penang benzoin is so characteristic and so strongly resembles storax, that I cannot doubt it is produced by a different species. It is pointed out in the Pharmacographia that *Styrax subdenticulatum*, Miq., occurs in W. Sumatra, and therefore in the province in which Penang is situated, and that this tree bears the same native name "kajoe kemingan," as *S. Benzoin*, as if it yielded a benzoin. There is also a fragmentary specimen of another species from Penang in the Society's Herbarium, viz: *S. Porterianum* but I have no evidence to offer that either of that yield Penang benzoin. The subject needs further investigation, and I hope that Mr. H. M. Ridley of the Singapore Botanic Gardens, with whom I have also been in correspondence on the subject, may be able ultimately to clear up the matter.

Attached to the Java specimen are some very curious galls of a cornucopia shape, developed at the expense of the flowers. These galls are produced in Java in such numbers that the production of fruit is much lessened thereby, and consequently the spreading of the tree is considerably diminished. The insect producing the galls has been quite recently described as a new species of aphis by Dr. A. Tschirch (*Ber. der deutsch. Bot. Ges.*, 1890, p. 48) under the name of *Astegopteryx styracophila*, Tschirch. The interesting account he gives of these galls is accompanied by illustrations, both of the insect and of the structure of the galls (tâf. iv.).

The specimen of the stem in section showing the gum resin exuding, does not bear evidence of the application of heat, although it has been stated that it is formed under the stimulant action of applied heat, benzoic acid not existing naturally in the bark. Neither in this specimen nor in that of the Siam benzoin tree, presented by Mr. Jamie seven years ago, is there any evidence of treatment beyond the application of an axe or adze to gash the bark.

I may here take the opportunity of pointing out that the Siam benzoin, which has a distinct vanilla odor, is also the product of a different species of styrax. The leaves, examined in section by Mr. Shenstone, of Colchester, some years ago, showed sufficient difference from those of S. Benzoin to indicate that they probably belong to a different species, whilst the drawing by Dr. Pierre in the Her-

barium of this Society of the ovary of a species of Styrax from Luang Prabang in the Laos States, where the Siam benzoin is produced, shows an oval or elliptical outline, that of S. Benzoin being spherical. —*Pharm. Journ. and Trans.*, Dec. 13, 1890, p. 519.

THE PHYSIOLOGICAL ACTION OF THE CONSTITUENTS OF THE ARTIFICIAL SALICYLIC ACID OF COMMERCE.[1]

By M. Charteris, M.D.
Professor of Therapeutics and Materia Medica, Glasgow University.

Dr. Latham, of Cambridge, in the Croonian lectures for 1886, thus formulated a rule for the administration of salicylic acid in the treatment of acute rheumatism: "The true salicylic acid from the vegetable kingdom must alone be employed. If you have to give large doses avoid giving the artificial product from carbolic acid, however much it may have been dialyzed and purified. An impure acid will very quickly produce symptoms closely resembling delirium tremens."

From time to time, before and after Dr. Latham's statement, doubts as to the prudence of prescribing the artificial acid were expressed in professional circles, and occasional reports of bad symptoms having followed its use were published in the medical journals. From my clinical experience, when from giving it in the hospital patients became delirious, I could not fail to see that it was a remedy to be watched and not to be trusted, and I relied entirely for the last ten years on salicin and the natural salicylate of sodium in treating rheumatism.

But yet I felt I might have been mistaken, and I resolved, with the assistance of Dr. MacLennan, to enter upon an experimental research as to the physiological action of the two acids.

I may briefly summarize the first experiments which I carried on with Dr. MacLennan on natural and artificial salicylic acid and their salts of sodium, by stating that artificial salicylic in a 10 grain dose and artificial salicylate of sodium in an 18 grain dose were sufficient to cause the death of a rabbit weighing from 2½ to 3 pounds, while

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[1] Read before the Pharmaceutical Society of Great Britain at an Evening Meeting in London, November 12; reprinted from *Phar. Jour. and Trans.*, November 22, p. 436.

natural salicylic acid and its salt of sodium in proportionate doses caused no bad results.

The deductions from these experiments indicated that artificial salicylic acid and its salt of sodium were dangerous to animal life, while natural salicylic acid and its salt of sodium were not.

Further, it was shown that the difference was due to an impurity in the artificial acid, not a trace of which existed in the natural salicylic acid.

This impurity was observed by experiment to be of the nature of a slow but certain poison, and that its lethal dose was relatively much less than that of the salicylic acid from which it was obtained.

I therefore concluded from these experiments that artificial salicylic acid contained an impurity or impurities, and that until this or these could be extracted by the aid of chemistry, the internal administration of the acid or its salt should be discountenanced. Large and repeated doses of the sodium salt were necessary in the treatment of acute rheumatism, and hence the restlessness, the confusion and the delirium attendant at times on their use. The retarded convalescence also which occurred in some cases of acute rheumatism after the salicylate treatment was due in all probability to the great and protracted prostration to which the impurity or impurities gave rise. In connection with these symptoms it was noted that prescriptions for the salicylate of sodium were invariably made up, unless otherwise indicated, from the artificial and not the natural salt.

The conclusion of the paper, which was published in the *British Medical Journal* of November 30, 1889, was "in a further communication we will state the physiological action of the acid from which the impurity has been removed."

An interval of some months elapsed before the artificial salicylic acid, purified by Dr. Henderson, of the Chemical Laboratory of Glasgow University, was submitted to the physiological test. The result was disappointing. We found that it caused death in a 10 grain dose, when administered to a full grown rabbit, and that the same thing happened when a sample of the acid of a Berlin firm, guaranteed pure, was tried under similar conditions.

In the paper read before the Royal Medico-Chirurgical Society on February 14th, I entered into full details as to the time when an article by the late Mr. Williams was brought under my notice, in

which one mode of purifying the artificial salicylic acid was given. Proceeding on the lines Mr. Williams laid down, and modifying in the final part his process by employing repeated slow crystallization from water instead of rectified spirit, a purified artificial salicylic acid was obtained identical in its chemical form, its solubility, its melting-point and its physiological action with that of the natural acid. It was also shown that if the form, the solubility and the melting-point varied in the artificial from that of the natural, no uniform physiological result could be obtained.

I did not venture to give a name to the impurity or impurities which could be extracted from commercial salicylic acid. I only said they were probably some form of cresotic acid, and left their investigation to chemists able and willing to make an exact analysis.

On the 4th of October I received with great pleasure a letter from Professor Dunstan, whose capabilities as a careful and competent chemist are well known in scientific circles, stating that he had made commercial salicylic acid a matter of investigation, and asking my co-operation in regard to the physiological action of the constituents which he had found in it. My assent was willingly given, and the results of these experiments will now be detailed.

On the 7th of October, 1890, I received from Professor Dunstan a sample of artificial salicylic acid and two samples of substances which had been removed from this acid and marked O-acid and P-acid, and I subsequently received another substance marked M-acid. For convenience of description the characters of these samples will be given in their alphabetical order, although the details of their physiological action are recorded in the order of time in which they were examined.

M-acid (meta-cresotic acid).—Hard white crystals, melting-point 174·5° C.

O-acid (ortho-cresotic acid).—White silky crystals, very light, melting-point 163° C.

P-acid (para-cresotic acid).—Whitish powder, somewhat like coarse flour, melting-point 151° C.

Artificial salicylic acid.—Small crystals with slight interlacing needles, melting-point 157° C.

These samples were examined as to their physiological action in the following way.

O-acid. October 18, 1890—10 a.m.—Two grains of this sample

were dissolved in twenty minims of rectified spirit and injected into a rabbit, which weighed one and a half pounds. Within fifteen minutes the animal assumed a prone position, with its hind legs stretched out.[1] In the course of half an hour the breathing became labored and there was also great prostration, as evidenced by the head resting between the fore-limbs and inability to move. In the evening the hind-limbs were completely paralyzed, and in thirty hours from the time of the injection being given the animal died.

P-acid. On the same day and at the same time two grains of this sample similarly dissolved were injected into a rabbit also weighing one and a half pounds. In the course of thirty minutes slight symptoms of prostration were evinced, but it was found that these were not so severe as in the previous case, for when roused the animal could move about fairly well. Yet it was observed that the animal was under the influence of a poison by its refusing to take food and by the peaked expression of its face. On the morning of the 10th it was found dead, having lived twelve hours longer than the rabbit which had received the injection of ortho-cresotic acid.

Artificial Salicylic Acid.—This acid was slowly crystallized from solutions in boiling water, and as the result of this procedure the crystals became better defined. On October 28th ten grains dissolved in rectified spirit were injected into a rabbit weighing three pounds. Another specimen of the purified artificial acid from Professor Dunstan in larger crystals also afforded a satisfactory result.

M-acid.—November 1, 1890. Two grains of this sample dissolved in rectified spirit were injected into a rabbit weighing one and a half pounds. In this instance there was not the slightest evidence of any unhealthy action.

Summary.—The ortho- and para-cresotic acids by their physiological action show that they are slow but certain poisons, causing prostration and paralysis affecting first the hind limbs and gradually extending over the body. The lethal dose is about 1 grain for a pound rabbit. These facts, now corroborated, were mentioned in the article which appeared in the *British Medical Journal*, Novem-

[1] The mode of injection in this and the following experiments may be stated. An assistant held the rabbit on its back. A piece of skin was picked up from the abdominal wall—the hypodermic needle was then inserted and the contents of the syringe slowly pressed out.

ber 30, 1889, as the result of trying the impurity obtained from salicylic acid, which Dr. Henderson had isolated by Mr. Williams' method but had not further examined. The meta-cresotic acid was innocuous.

The conclusion from all these experiments seems to be that a high melting-point is not the only or the best test for purity. Something more is required, and this is that the artificial crystals should be identical with those of the natural variety, for similarity of crystallization seems to be absolutely essential to secure a uniform and harmless physiological action. Pharmaceutical chemists may not have the apparatus or the time for applying the melting-point test, but they can all easily observe the difference between well-defined crystals, like those of strychnine, and others which present an appearance like quinine.

The well-defined crystalline form of the acid with a melting-point of almost 157° C., should be the official form of artificial salicylic acid, and from this alone should the salicylate of sodium be prepared.

I may add that if salicylic acid be prepared from synthetic carbolic acid, having a melting-point of 42° C., it then contains no impurity. Its melting-point is 157° C., and its physiological action is in every way satisfactory. This pure carbolic acid is about three times the price of the ordinary form, and until this can be reduced the more economical plan will be to produce salicylic acid from ordinary carbolic acid and subsequently to purify it.

I would recommend as additions to the forthcoming Addendum of the British Pharmacopœia—

ACIDUM SALICYLICUM PURIFICATUM.

Characters.—White, separate, large, prismatic crystals, inodorous, taste at first sweetish, then acid. Soluble in about 500 parts of cold water and 15 of boiling water; readily soluble in hot chloroform; soluble in alcohol and ether. Melting-point about 157° C. Dose, 10 to 30 grains

SODII SALICYLAS PURIFICATA.

Obtained by the action of purified salicylic acid on carbonate of sodium.

Characters.—Well defined white odorless crystalline scales, having a sweetish saline taste; soluble in nine-tenth part of its weight in water, or in 6 parts of rectified spirit. Dose, 10 to 30 grains.

Professor Dunstan agrees with me as to the importance of making these additions to the Addendum, and in this way avoiding the great delay which would be involved in waiting for a new edition or reprint of the Pharmacopœia itself.

NOTES ON ESSENTIAL OILS AND ALLIED PRODUCTS.

By Geo. M. Beringer, Ph.G.

Abstract from the Semi-Annual Report of Schimmel & Co.

Alant Oil (from Inula Helenium, L.)—The liquid constituent of alant root can only be obtained in very limited quantities. The drug is now worked exclusively for its helenin, a crystallizable substance melting at 66° C., which has recently been successfully employed in Spain against cholera. According to Marpmann, helenin prevents the development of tuberculosis.—See Amer. Jour. Pharmacy, 1876, p. 353, and 1884, p. 530 and 646.

Almond Oil, Essential.—Attention is again directed to the sophistication of bitter almond oil with artificial benzaldehyde and the value of the test for the detection of the latter published in their April report. The test offered is as follows: "Into a small porcelain vessel sitting in a larger one, is placed a piece of filter paper folded together like a lighter and soaked with the oil to be tested. This paper being set on fire, it is quickly covered with a two-liter beaker ready at hand, which is moistened inside with distilled water. The gases arising from the combustion settle on the damp sides of the beaker and with a little distilled water are washed into a filter. The addition to the filtrate of a solution of nitrate of silver should not cause any turbidness, much less a precipitate of chloride of silver. The value of the test depends upon the fact that the artificial oil, prepared from benzylchloride, shows traces of chlorine products, which cannot be removed. Genuine oil distilled from almonds or peach kernels, never gives a chlorine reaction.

Recently Heppe has proposed another test for the detection of artificial benzaldehyde in bitter almond oil. He allows a few drops of the oil to fall into a melted mixture of KHO and KNO_3 mixed intimately by stirring with a platinum wire. The flux is dissolved in water acidulated with nitric acid and tested for chlorine with silver nitrate. These tests are based upon the same scientific principles.

Anise Oils.—According to reports from Russia the favorable weather has resulted in more than an average yield of anise in the cultivated areas. The production of anise has almost continually increased, not only in Russia, but also in Italy, Syria and Turkey, and India has recently entered the field. The resulting decline in price of the oil will enable it to largely displace star-anise oil. A monopoly of the latter oil is reported to have been secured by a French firm in Hanoi, from January 1, 1891.

Boldo-leaf Oil.—According to the Real-Encyclopädie der gesammten Pharmacie, boldo-leaf oil is employed in affections of the liver and in gall-stones, as also recently against gonorrhœa, dyspepsia and rheumatism.

Camphor and Camphor Oil.—From January 1st to August 7th, of this year, the shipments of camphor from Japan amounted to 19,042 tubs or about 1,428,150 kilos, and thereby attained the average of the previous year, which witnessed a total export of 2,487,458 kilos. It cannot be overlooked that the production of camphor is decidedly too small compared with the world's demand, now that, both in the celluloid industry and also in the manufacture of smokeless powder, two consumers of importance have arisen. It is, therefore, urgently to be desired that planting of the trees in Japan should be extended, and that experiments should be made with its cultivation in other countries with suitable climates. In February, 1889, camphor plants were brought from Hongkong to Singapore, but nothing has yet been announced as to the success of the experiment. The percentage of camphor in the oil is stated to be so much less than formerly that it hardly pays to work it. Nothing is more likely than that the Japanese, in consideration of the enormous market value of camphor, now work up the residues. Messrs. Schimmel & Co., refer to *light camphor* oil, sp. gr. 0·895–0·920 and to heavy camphor oil (boiling between 240° to 300°, sp. gr. 0·970.) Heavy camphor oil is of a pale green color and oily consistence, inflames with difficulty and has a powerful antiseptic and disinfectant action. It is a good solvent for resins of all kinds and for india rubber and is useful to render varnishes flexible.

Cassia Oil.—The quality of the oil received in recent shipments appears to approach the good quality of that of former years. The Chinese have plainly confessed adulteration with resin and mineral oil, and adulterated qualities are still quoted in Hongkong. The following are results of recent examinations of shipments since April:

	Sp. gr.	Residue from Distillation.	Per Cent. of Aldehyde.
Cheong Loong, ...	1·061	8 per cent. soft	77
" "	1·061	6 " "	77
Yan Loong, ...	1·058	8·5 " "	78
" "	1·060	7 " "	77
Ye Tac, ...	1·062	18 " hard	45

It is recommended to purchase cassia oil on the guaranteed aldehyde strength.

The following process for estimation of aldehyde is recommended: 10 cc. of the oil to be examined are measured with the pipette and allowed to run into a specially manufactured flask of 100 cc. capacity, with a neck 13 cm. long and 8 mm. internal width, which is divided into tenths up to 6 cc., the last drops being blown out of the pipette with the mouth. The flask is then about three-fourths filled with a 30 per cent. solution of sodium bisulphite and the contents thoroughly mixed by shaking. It is then warmed on the water-bath until the curd formed is *completely dissolved* and there floats on the solution a layer of clear oil, sharply defined against the solution. The flask is then allowed to cool and filled up with the bisulphite solution (toward the end, drop by drop), till the oil has entirely risen into the neck of the flask and its lower limit accurately coincides with the lowest mark on the neck. This oil consists of the non-aldehydes, whose volume, subtracted from the 10 cc. oil used, shows the amount of cinnamic aldehyde contained. Strictly speaking, these are volume

and not weight percentages; as, however, the specific gravity of the non-aldehyde in Cassia oil (1·060 at 20° C.) almost exactly accords with that of cassia oil (1·059–1·061 at 20° C.), the actual difference is only small and of no practical importance.

If the curd will not dissolve after a day's heating an extraordinarily heavy adulteration, with a hard resin, may be assumed, in which case a volumetric estimation of the aldehyde is impossible. When the oil is adulterated with both resin and mineral oil, the separated non-aldehydes are still liquid in the presence of 30 per cent. of resin.

The cinnamic acid present in every cassia oil is determined in this process as cinnamic aldehyde. As, however, even in very old oil less than 1 per cent. of acid is present, this error is insignificant.

If the percentage of cinnamic aldehyde present is less than 70 per cent., the distillation test is serviceable for the detection of sophistication. If the residue left at 290° amounts to over 10 per cent. and is firm, hard resin has been used; if it remains liquid, after cooling, fatty oils or other liquid adulterants have been used.

In order to determine the resinification of cassia oil, under the influence of the air, 200 cc. of the oil was placed, on September 20, 1889, in a glass dish only covered with perforated filter-paper in a room exposed to midday sunshine and continually heated in winter. Light, warmth and access of air, the three active agents for effective resinification, were therefore present in such abundance, as they never occur in keeping the oil in commerce.

In the course of the experiment the oil underwent the following alterations:

Examined.	Distill. Residue.	Cinnamic Aldehyde.	Cinnamic Acid.
Sept. 20, 1889, ...	5·5 per cent.	77·7 per cent.	0·7 per cent.
May 1, 1890, ...	10·6 "	— "	— "
Sept. 10, 1890, ...	12·6 "	68·5 "	8·5 "

The cinnamic acid was estimated by shaking out the oil with hot soda solution and identified as such by the melting-point 131° C. (m. p. pure cinnamic acid, 133°) and by the formation of benzaldehyde by oxidation with permanganate of potassium.

Messrs. Schimmel have examined the tests proposed by Mr. Ed. Hirschsohn (see AMER. JOURN. PHARMACY, 1890, p. 294 and p. 487). He found that a pure cassia oil, shaken with three times its volume of petroleum ether, should undergo no alteration of volume. They report a variation observed in the volume of both pure and sophisticated oils, though with the former somewhat less. The differences were too small for a practical test. The correctness of Hirschsohn's other test is confirmed. It is: To a solution of cassia oil in 70 per cent. alcohol 1 : 3 is added, drop by drop, half its volume of saturated solution of lead acetate in alcohol of same strength, no precipitate should form, otherwise colophony or similar resin is present. Oils without the addition of resin remain quite clear, as also the old cassia oils with their slightly increased content of cinnamic acid. On the other hand, the sample of oil mentioned above, as containing 8·5 per cent. of cinnamic acid in consequence of exposure to air, did not satisfactorily stand the test. As such oils, however, are not met with in commerce, the possibility of a precipitate of cinnamate of

lead would only have to be borne in mind in the examination of old cassia oil left in badly-closed vessels.

Eucalyptus Oils.—The production of the genuine oil of Eucalyptus Globulus in Algiers only amounts to about 2,000 kilos per year. The consumption of eucalyptus has not increased, on the whole, especially since a highly productive substitute has been found in cajeput oil for the preparation of eucalyptol (cineol). P. W. Squire has called attention, in the *Chemist and Druggist*, to an oil coming in the market as that of Eucalyptus amygdalina, which contains no phellandrene and rotates a ray of light to the right instead of to the left. Similar observations have been made, and the opinion is expressed that the various kinds of the eucalyptus leaves are no longer carefully separated. Large samples of the distillate of Eucalyptus maculata var. citriodora have been received from Queensland. Its sp. gr. at 15° was 0·873. When distilled, about ¾ goes over between 205°–210°; while smaller fractions boil under and above these temperatures. The fraction 205°–210° consists almost entirely of pure *citronellon*. When shaken with solution of sodium bisulphite, the mixture becomes hot and a fairly solid mass forms, from which, after washing with ether, pure citronellon separates on decomposing with soda solution. The fraction boiling under 200°, about 4 per cent., showed none of the characteristic reactions of cineol (eucalyptol), and it must, therefore, be assumed that this body is not present in the oil of Eucalyptus maculata var. citriodora. The well-rectified oil is colorless, has a pleasant melissa-like odor, and may be useful in perfumery and soap manufacture. Cineol is reported as existing in the following oils not previously reported as containing it: Zedaary root oil (Curcuma Zedoaria), California Laurel oil (Oreodaphne californica) and in oil of Canella alba.

Garlic Oil.—This is now prepared principally for use in sauces and spices. 1,600 kilos of fresh garlic yield 1 kilo of the oil; sp. gr. 1·057 at 15°.

Geranium Oils.—The African Geranium oil from Algiers is now brought in competition with oil from a new source, Réunion, and in the neighboring isle, St. Mauritius, distillation is also carried on on a smaller scale. The Réunion oil is distinguished by a beautiful green color, which is not due to presence of copper. No important chemical differences appear to exist between the two kinds. The specific gravities are as follows: Algerian, 0·899; Réunion, 0·891. The so-called "Turkish" geranium oil is distilled from the well-known grass, Andropogon Schœnanthus. A great part of that distilled in the Nimar district is adulterated by the distillers with turpentine oil, regularly supplied from Bombay for the purpose. The grass flowers in October and November, when it is cut and distilled; 373 pounds of grass from Kandesh, distilled in Bombay, yielded 1 pound 5½ ozs. of oil. The oil adulterated with turpentine is the ordinary Ginger-Grass oil of commerce. For statements of F. W. Semmler, regarding composition of Indian Geranium oil, see AMER. JOUR. PHARMACY, 1890, p. 400.

Lavender Oil.—The reappearance of an old test for detecting adulteration in lavender oil—namely, the solubility of the oil in 3 parts of 70 per cent. volume alcohol at 16° C.[1]—induced Messrs. Schimmel to make an inspection of the

[1] This test was recently given prominence in a circular to the trade by Mr. George Lueders, who stated that 1 part of lavender oil dissolved in 3 parts of

finest products of the lavender districts of South France. As will be seen from the appended table, the sp. gr. varied considerably, and gave evidence of a relationship to the solubility, those of lower gravity being more soluble. The optical polarizing power is also subject to considerable variation, and does not appear to be very suitable for the detection of adulteration.

	Source and Age.	Sp. gr. at 15°.	Rotation in a 100 mm. col.	Solubility in 70 per cent. alcohol.
A	Alpes maritimes, 1889, ...	0·897	— 4° 15′	insoluble
B	" " "	0·896	— 6° 8′	"
C	" " "	0·893	— 8° 22′	"
D	" " "	0·894	— 8° 16′	"
E	Gard, 1889, ...	0·891	— 9° 20′	insoluble at 16°, but dissolved on warming to 20°.
F	Alpes maritimes, 1889, ...	0·887	— 4° 48′	soluble
G	" " "	0·887	— 7° 8′	"
H	" " "	0·888	— 6° 51′	"
I	Gard, 1889, ...	0·888	— 6° 20′	"
K	Drôme, 1889, ...	0·885	— 6° 48′	"
L	Alpes maritimes, 1889, ...	0·889	— 6° 58′	"
M	Drôme, 1890, ...	0.885	— 4° 26′	"
N	Hérault, 1889, ...	0·887	— 6° 56′	"

In order to discover the constituent, which was the cause of the insolubility, 25 kilos A was fractionated with steam. Lavender oil, boiling at a higher temperature than turpentine, the latter, if present, would appear in the first fraction and be detected by its slight solubility in 70 per cent. alcohol. But the four first fractions readily dissolved, and only the last and smallest refused to dissolve. The presence of turpentine was, therefore, negatived.

The difference in behavior with the solvent ought to be ascribed to the fact that in the case of insoluble oils the distillation is pushed further than in that of the soluble, i. e., that constituents with higher boiling points and difficultly soluble are carried over toward the end of the process. It is probable that the soluble oils are subjected to rectification in which the least volatile fractions are kept back. These experiments prove that an oil may be unadulterated and not stand the test. Messrs. Schimmel state that the test is unreliable in detecting adulteration, as the soluble oils G, H and I dissolved perfectly clear with 70 per cent. alcohol at 16° even after the addition of 15 to 20 per cent. oil of turpentine. The age of the turpentine used proved to have some influence on the solubility. Of an old, somewhat resinified oil of turpentine, 20 per cent. could be added, whilst of a freshly rectified specimen only 15 per cent. were admissible.

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the 70 per cent. alcohol, and 1 part of spike oil in 2 parts. Insolubility indicating adulteration with turpentine, camphor oil, castor oil, etc. The test is stated to be relied on by the large houses in Grasse, who all buy these oils from small distillers in the mountains. G. M. B.

Massoy bark Oil.—The raw material is imported from German Guinea. An import of worthless bark is reported from Java, devoid of odor and of another botanical origin.

R. Woy reported a new terpene, massoyene, as contained in the oil (see AMER. JOUR. PHARMACY, 1890, 296). Prof. Wallach has now shown this to be erroneous (Liebig's Annalen, vol. 258, 340). The so-called massoyene is a mixture of not less than three distinct terpenes, namely, pinene, limonene and dipentene.

Mustard Oil.—The new German Pharmacopœia, having again rightly negatived the substitution of the artificial product by recognition of the natural oil alone, reasons for the presence of the former in pharmacy are finally removed, and it is hoped that continued endeavors to find a distinctive test may be successful.

Myrtle Oil.—Myrtol obtained from this oil is not a simple body, but a mixture of pinene, cineol and dipentene boiling between 160° and 180° C. It is recommended for its valuable antizymotic and deodorant properties, being useful to disinfect the lungs, as through this organ it is chiefly excreted.

Peppermint Oils.—Dr. Ed. Polenske has observed that peppermint oil which had stood for some time in sunlight lost the power of giving color reactions with acids (see AMER. JOUR. PHARMACY, 1890, page 491). The III Dutch Pharmacopœia requires as a test for the identity of peppermint oil that a mixture of 5 drops with 20 drops of glacial acetic acid shall gradually develop a dark blue color with a copper colored fluorescence. It has been observed that the formation of the colored compound was due to oxidation, and did not occur when air was excluded. If a small bottle is completely filled with the mixture of acetic acid and oil, and closed with a cork, the mixture becomes scarcely perceptibly blue, and the color does not deepen in intensity after several days. If air is admitted, the change gradually takes place. It is curious that Japan peppermint oil gives no color reaction or only to a very slight extent.

The new German and the Austrian Pharmacopœias require that peppermint oil shall form a clear solution with diluted alcohol. To this condition the Mitcham peppermint oil answers, while the requirement of the Dutch Pharmacopœia, which only prescribes complete solubility in 90 per cent. alcohol, admits the American oil also.

Pepper Oil.—Phellandrene is proven to be a constituent of this oil by the formation of a solid nitrite on adding sodium nitrite to a solution of the oil in glacial acetic acid.

Rose Oil.—Messrs. Schimmel report favorably upon the results of their experiment of producing otto of rose in Germany, and the supply of superior oil in the future is guaranteed. Twenty-three thousand kilos of freshly-gathered roses yielded 4½ kilos of otto. The adulteration of the Turkish rose oil with geranium oil is still carried on to a large extent. The government has forbidden the import of this oil, but it continues to be smuggled into the country. Rose oil, mechanically freed from stearopten, is now an article of the trade. It was observed, during the purification of a large lot of stearopten from Turkish rose oil, that when distilled in vacuo no constant boiling point could be obtained, and that the lower boiling fractions remained liquid at normal temperatures, while those boiling at higher temperatures immediately

solidified. By digesting the stearopten near its melting point and by repeated crystallization two constituents were obtained, one melting at 41° C. and the other at 22° C. The stearopten from German rose oil behaved the same. One part was separated from it, melting at 22° C., and another, which melted between 40°–41° C. It is therefore manifest that contrary to the views hitherto held, rose oil stearopten is no uniform substance, but a mixture of what are probably a whole series of homologous hydrocarbons.

Wintergreen Oil.—An artificial product, recently received in New York from Hamburg, contained such a large proportion of methyl benzoate that it was easily recognizable by the odor. Its sp. gr. was only 1·133. Genuine oil being 1·180 and methyl benzoate 1·095, it was presumably a mixture of about equal parts of methyl benzoate and salicylate.[1]

Messrs. Schimmel report having experimented with a number of novelties of their own distillation.

Mosoi flower oil.—The material received from the South Sea Islands under the name of mosoi flowers proved to be dried cananga flowers: 8½ kilos yielded 100 grms. of oil, sp. gr. ·922, differing somewhat in odor from Indian cananga oil, but contained large quantities of benzoic acid.

Walnut leaves oil (Juglans regia).—800 kilo yielded 235 grms. of oil, solid at ordinary temperatures, and of a pleasant tea-like odor.

Japanese Pepper Oil, from Xanthoxylum piperitum D. C., known in Japan as "Sansho." The comminuted fruit yielded 3·16 per cent. of a yellowish essential oil, sp. gr. 0·973 boiling between 160°–230° C., having a pleasant lemon-like odor, probably due to citral.

Ash Bark.—The bark of *Fraxinus americana* yielded 0·030 per cent. of oil, which, at ordinary temperatures, has a consistence of butter and a characteristic fruity odor.

Bugleweed, Lycopus virginicus.—The dried herb yielded 0·075 per cent. of oil, sp. gr. 0·924 at 15° C.

Spicewood, Lindera Benzoin, *Blume.*—All parts of the shrub possess pleasant aromatic odors which, however, are strikingly different. The bark yielded 0·43 per cent. of an oil smelling like wintergreen, sp. gr. 0·923 and boiling between 170°–300°. The berries yielded 5 per cent. of an aromatic and camphoraceous smelling oil, sp. gr. 0·855, boiling point 190°–270° C. This oil had been prepared by Dr. A. W. Miller,[2] who obtained about 4 per cent., sp. gr. 0·850. The twigs yielded 0·3 per cent. of an oil smelling like camphor and calamus, sp. gr. 0·925. The leaves yielded 0·3 per cent. of oil with a pleasant lavender-like odor, sp. gr. 0·888.

Sweet Fern Leaves.—The dried leaves of Myrica asplenifolia, *Endl.*, yielded 0·08 per cent. oil, with a cinnamon-like odor, sp. gr. 0·926 at 15° and becoming solid in a freezing mixture.

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[1] The presence of a benzoic ether in a commercial sample of artificial oil of wintergreen was reported in AMER. JOUR. PHARM., 1889, p. 404.

[2] In *Proceedings Amer. Pharm. Assoc.*, 1878, p. 773, Dr. Miller reported the oil of a bright green color, and in taste resembling that of allspice and prickly ash; yield not quite 1 per cent. P. M. Gleim (AM. JOUR. PHAR., 1875, p. 246), reported 5 per cent. of oil, sp. gr. ·870 of a fragrant odor resembling that of jessamine.—G. M. B.

Botan Root (Pæonia Moutan), a Japanese drug, yielded no essential oil, but yielded *peonol*, a substance first found by Will, of a pleasant aromatic odor, crystallizing in large needles.

Citral.—This name has been proposed for terpene-free lemon oil containing only the valuable aromatic portion of the oil. It has been prepared to meet the demand for a more soluble oil. In a partial vacuum under a pressure of 16 mm. citral boils at 116° C., and under normal atmospheric pressure at 228°–229°, without decomposition, if pure. Its sp. gr. is 0·899; it is probably an aldehyde, as it forms stable compounds with alkaline acid sulphites. Its formula is probably $C_{10}H_{16}O$. Lemon oil contains only an average of 7½ per cent. of citral.

MINUTES OF THE PHARMACEUTICAL MEETING.

On motion of the Registrar, Mr. Wm. B. Webb was called to the Chair, and the reading of the minutes of the last meeting was dispensed with.

Prof. Maisch presented to the library from Mr. Lancaster Thomas a copy of Lemery's Course of Chemistry translated and edited by James Keill, third English edition, published in 1698; and also a copy of the Prussian Pharmacopœia of 1840.

Professor Maisch stated that he had received from Professor Alfonso Herrera a copy of the Appendix to the Mexican Pharmacopœia which has just been issued, and that a copy of it would also be sent to the library of the College, by the Mexican Academy of Pharmacy; also that an advance copy of the Additions to the British Pharmacopœia, had been forwarded to him by Professor Attfield. Among the remedies made officinal in the latter work, for the first time, was glonoin, a solution being directed under the title of *liquor trinitrinæ*, of the strength of one part of nitroglycerin in one hundred parts of alcohol; *Eucalypti Gummi*, described as being almost entirely soluble in rectified spirit, cold water dissolving from 80 to 90 per cent. of the gum; *Euonymi cortex* (and dry extract), *Hamamelidis cortex* (tincture 1 : 10), *Hamamelidis folia* (and fluid extract), *Hydrastis rhizoma* (tincture 1 : 10, and fluid extract), Strophanthus (tincture 1 : 20), Adeps lanæ and Adeps lanæ hydrosus (lanolin), Oleum cadinum, Picrotoxinum; and of the recently discovered chemicals Acetanilidum (antifebrin), Glusidum (saccharin), Homatropinæ hydrobromas, Paraldehydum, Phenacetinum, Phenazonum (antipyrine), and Sulphonal. Among the pharmaceutical preparations adopted are Syrup of ferrous chloride; glycerin suppositories with 70 per cent. of glycerin, and prepared with gelatin; Menthol plaster with 20 per cent. of menthol.

A new German Pharmacopœia has made its appearance, and this is for the first time printed in the German language, it has heretofore been issued in Latin; percolation has been introduced for the preparation of fluid extracts, which are now officinal.

Mr. Beringer suggested that the pharmaceutical meetings might probably be rendered more attractive and the attendance greatly increased; he thought that a committee appointed for the purpose could bring forward subjects of general interest, and induce members to furnish papers or information upon these subjects.

Professor Maisch favored the plan, and moved that the Chairman appoint a committee of five for the purpose indicated.

Mr. Ellis asked if the reputation of the pharmacist of to-day was equal to that of the pharmacist of forty years ago.

Mr. McIntyre said he was not in business forty years ago, but that the pharmacist of the present time was ready for any business that offered; that to carry on the business successfully required about three times as much work now as it did ten years ago, a much greater investment of capital and greater expense in the matter of help about the store. In his opinion it was proper that all the preparations of the Pharmacopœia should be made in his store.

The query was raised what is the proper article to dispense when *fluid extract of witch hazel* is prescribed; that of the leaf or bark? It was claimed that as the extract of the leaves is officinal it should be dispensed unless otherwise ordered.

Mr. Thompson said that 40 or 50 years ago there were comparatively few scientific pharmacists and relatively a large community who would naturally look to them and obtain their medicines from them; and that now the greater number of educated pharmacists rendered the individual less prominent. By making and dispensing his own pharmaceutical preparations, every pharmacist would secure the confidence of the physician and of the public.

Mr. Beringer recommended that new drugs or preparations introduced for medical use be brought forward as subjects for discussion at these meetings.

Mr. Thompson referred to the recent action of the American Medical Association in establishing a section of materia medica and pharmacy to which pharmacists will be admitted, and said that if this action was met in a proper spirit, keeping steadily in view the advantages which would accrue from a harmony of action to both professions, instead of thrusting every grievance, real or fancied, upon the attention of the section, then a great deal of good would be accomplished and much closer and fairer relations between the two professions would be effected.

There being no further business, a motion to adjourn was put and carried.

T. S. WIEGAND,
Registrar.

EDITORIAL.

The Philadelphia College of Pharmacy has been lighted by electricity since the middle of December. Measures had been taken by the Board of Trustees to have this improvement in use at the beginning of the session, but the delay occurred through the inability of the electric company of furnishing the necessary current at an earlier day. Each of the lecture rooms is now supplied with thirty Edison incandescent lamps, and a sufficient number of them have been placed in the different rooms, offices, hall-ways, the museum, etc. To mark this event a social gathering of the members of the College and their ladies was arranged for the evening of January 2, under the direction of a Committee consisting of Howard B. French, Professor Remington and Dr. A. W. Miller. Nearly two hundred persons assembled in the Pharmacy lecture room to listen to an informal talk—as it was called—on electricity by Professor E. J. Houston, of the Central High School, who gave a brief but very interesting résumé of the history of electricity as a science, and of the progress made in its varied applications, dwelling also upon some of the problems awaiting solution to still

further increase the usefulness of that force. The motors now in use in the United States were estimated at not less than 20,000 horse-powers, besides about 175,000 horse-powers on electric railways running over 2,000 miles of track. In producing the electric light at the present time, it was stated that much of the energy was wasted through the production of heat; but the electric light of the future would be similar to that of the glow-worm and fire-fly, where all the energy was used in producing light without heat. The concentration of energy would be reached, when it became possible to produce electricity directly from the burning of coal, which would render useless the steam-engine of to-day. The application of electricity as a therapeutic agent, for aërial navigation and many other purposes was also alluded to.

After the conclusion of the lecture, Professor Sadtler showed the materials from which the different kinds of electric lamps are made, and illustrated experimentally the principles governing incandescent and arc lighting, and of some electric phenomena.

A microscopic exhibition had been arranged in the library by the instructor in microscopy, A. P. Brown, Ph.G., who showed many objects interesting to the pharmacist and of general interest.

A collation was served in the museum, where an orchestra was stationed, and contributed much to the pleasure of the evening. The entertainment was evidently enjoyed by all present, many expressing the wish that such social gatherings would take place more frequently in the future than has been the case in the past.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

The Medical Bulletin Visiting List, or Physician's Call Record. New edition. Philadelphia and London: F. A. Davis. 1891. Price, $1.25 (70 patients); $1.50 (105 patients).

This visiting list is stated to be arranged upon an original and convenient monthly and weekly plan for the daily recording of professional visits. The plan is quite simple, and is easily understood; the make-up of the pages is such as to facilitate the correct keeping and the examination of the professional records. Various tables, formulas and other information for convenient reference are printed upon the first 24 pages.

A Laboratory Manual of Chemistry, medical and pharmaceutical, containing experiments and practical lessons in inorganic synthetical work; formulas for over three hundred preparations, with explanatory notes; examples in quantitative determinations and the valuation of drugs, and short systematic courses in qualitative analysis and in the examination of urine. By Oscar Oldberg, Ph.D., etc., and John H. Long, Sc.D., etc. With original illustrations. Second edition, revised and enlarged. Chicago: W. T. Keener. 1891. 8vo. pp. 475. Price, $3.50.

On the first appearance of this work, about three years ago, we have given an extended account of its scope and arrangement, showing that it is a guide to practical work in the laboratory, the authors being directors of the pharmaceutical and chemical laboratories in the Northwestern University. In noticing the present edition, we observe that the chapter on the analysis of urine

has been entirely rewritten and enlarged to bring it up to our present knowledge, and that a new chapter on the microscopical examination of urinary sediments has been added. The remainder of the work is an exact reprint of the first edition, except that typographical errors, as far as observed, have been corrected, and that several alterations have been made in the descriptions of the methods of preparing certain pharmaceutical products.

A Manual of Weights and Measures, including principles of metrology, the weights and measures now in use, weight and volume, and their reciprocal relations, weighing and measuring, balances (scales) and weights, measures of capacity, specific weight and specific volume, etc., with rules and tables. By Oscar Oldberg, Ph.D., etc. Third edition, revised. Chicago: W. T. Keener. 1890. 8vo. pp. 256. Price, $1.50.

The first and second editions of Professor Oldberg's work on weights and measures were noticed at the time of their appearance; the present edition differs from the preceding one mainly in the re-arrangement of the tables of the co-efficient of expansion of certain liquids. It is obvious that a study of the subject matter is of especial interest at the present time, since the metric system has been adopted for the revision of the Pharmacopœia.

Proceedings of the Ninth Annual Meeting of the Virginia Pharmaceutical Association, held at Old Point Comfort, September 9 and 10, 1890. Lynchburg. 8vo. pp. 79.

A brief account of the meeting will be found on page 539 of our last volume.

Catalogue des thèses soutenues devant l'École de Pharmacie de Paris, 1815–1889. Par le Dr. Paul Dorveaux, Bibliothécaire de l'École supérieure de pharmacie de Paris. Avec une préface de M. G. Planchon, Directeur de l'École supérieure de pharmacie de Paris, membre de l'Academie de médecine, etc. Accompagné d'un fac-simile de la synthèse illustrée de cheradame. Paris: H. Welter, Editeur. 1891. 8vo. pp. 75.

The collection of theses at the Paris School of Pharmacy is incomplete, but in some cases the titles of the missing theses could be supplied. The list is arranged in chronological order, and gives also brief biographical data of the authors, dates of the publication of the theses, etc.

Beitrag zur Kenntniss der Isomerieverhältnisse innerhalb der Terpenreihe. Inaugural-Dissertation von Edward Kremers aus Milwaukee. Göttingen. 1890. 8vo. pp. 74.

Contribution to the knowledge of isomerism within the terpene series.

A dissertation from the University of Göttingen for the degree of Doctor of Philosophy.

The Treatment of the Morphine Disease. By J. B. Mattison, M.D., Home for Habitués, Brooklyn. pp. 24.

Reprint from the Therapeutic Gazette, September, 1890.

Abnormal Intra-Thoracic Air-Pressures and their Treatment. By Charles Denison, A.M., M.D., of Denver, Col. 8vo. pp. 41.

An address delivered by President Denison, at the Seventh Annual Meeting of the American Climatological Association, and reprinted from the Sanitarian of November, 1890.

OBITUARY.

Professor Dr. Heinrich Will died in Giessen, October 15, 1890, aged 78 years. After completing his school education, he became a pharmacist, and subsequently continued his studies at the University of Heidelberg, where he became the assistant of Geiger and, afterward, of Gmelin. In 1837, he went to Giessen as the assistant of Liebig, received the degree of Dr. Phil. in 1839, then became lecturer on chemistry, and, in 1846, was called to the chair of experimental chemistry, retiring from that position in 1882. He was an excellent teacher, both in the lecture hall and in the laboratory, and though not a prolific writer, was well known throughout the scientific world as an author and investigator. His name is connected with researches on the determination of nitrogen, the valuation of alkali, the analysis of urine, the glucosides of mustard, several volatile oils, some alkaloids, etc. Will's analytical tables and his work on qualitative analysis have been used in most civilized countries. When Liebig retired as editor of the famous Jahresbericht der Chemie, Kopp and Will became the editors from 1857 to 1862, and for the following five years the work was issued by Will alone.

Professor Dr. Heinrich Schwarz died in Eberswalde, September 15 last, aged 66 years. For some years he had been connected with the University of Breslau, and afterward with the Technical High-school at Gratz, retiring from the latter position about a year ago. His numerous researches relate, mostly, to applied chemistry and to methods of analysis; he took great interest in the introduction of volumetric analysis and in the perfection of its processes.

Emma Bour Nardyz, Ph.G., class 1889, died in Philadelphia, November 30 last, of typhoid fever, at the age of 24 years.

VARIETIES.

Resorcin spray in Whooping Cough.—Dr. J. W. Farlow (*Boston Med. and Surg. Jour.*) uses a 2 per cent. solution in water which is sprayed into the nose, pharynx and larynx every two hours. Thus used the solution is inodorous, nearly tasteless, non-irritating, and not poisonous, but gives speedy relief.

Styron or cinnamic alcohol has been found by Dr. Tcheltzoff (*Bolnit. Gazeta Botk.*) to act as an excellent disinfecting and deodorizing agent, useful in purulent discharges of the ear. Styron is a constituent of Peru balsam and of storax, and is somewhat soluble in water, but freely soluble in alcohol and ether.

Aristol, for external use, is combined by Dr. Pollak with soft soap, as follows: Aristol, 3; alcohol 5; ether, 5; soft soap, 30 gm. Soft paraffin is, likewise, a good vehicle for the external application of aristol. (*Monatsh f. Pr. Dermat.*) A mixture of equal parts of lanolin and petrolatum has been recommended for the same purpose.

Camphorated Salol (see AMER. JOUR. PHAR., 1889, p. 136) is recommended by Dr. Cuvillier in the treatment of suppuration of the ear. The meatus having been cleansed with solution of boric acid, the camphorated salol is applied by means of a tampon of wool, which is allowed to remain in the ear not longer than twenty-four hours.—*Revue d'Otol.*

CLASSES

—OF THE—

PHILADELPHIA COLLEGE OF PHARMACY,

SEVENTIETH ANNUAL SESSION, 1890-1891.

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Ware, Louis Cornelius,	Union Springs,	Ala.	H. H. Hayes.
Weisner, Nicholas Frederick,	Leesport,	Pa.	L. A. Podolski.
Wellinseck, Harry,	Atlantic City,	N. J.	A. D. Cuskaden, Ph.G.
Welsh, Charlie Augustus,	York,	Pa.	A. H. Lafean & Bro.
Westphal, Charles,	Hamburg,	Germany,	Emil Graff.
Whilt, John Henry,	Philadelphia,	Pa.	Dr. I. R. Landis.
White, Charles Henry,	Titusville,	Pa.	Geo. B. Evans, Ph.G.
White, Preston Barnes,	Chambersburg,	Pa.	H. A. Newbold, Ph.G.
Whittem, William Henry,	Philadelphia,	Pa.	William A. Whittem.
Wier, Thomas Jefferson, Jr.,	Wilmington,	Del.	N. B. Danforth, Ph.G.
Wilkinson, Howard Marion,	Camden,	Del.	F. H. Davis, Ph. G.
Wilkinson, Richard.	Philadelphia,	Pa.	Frank Bowker, Ph.G.
Williams, Charles Morgan,	Lambertville,	N. J.	Geo. M. Shamalia, Ph.G.
Winch, Howard George,	Bethlehem,	Pa.	Harry Lee Barber.
Wingert, Harry Kitzmiller,	Knoxville,	Tenn.	G. A. Wingert.
Wirth, Alexander Edward,	Milwaukee,	Wis.	Oscar Zinn.

Name.	*Place.*	*State.*	*Preceptor.*
Wohlgemuth, Julius,	Philadelphia,	Pa.	Frank C. Davis.
Wright, Thomas Edmund,	Germantown,	Pa.	Bullock & Crenshaw.
Yohn, Charles Ragan,	Hagerstown,	Md.	Jas. H. Munson, Ph.G.
Zimmerman, Howard,	Mt. Carmel,	Pa.	E. W. Sharp.

SENIOR CLASS.

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Arnold, Henry Peter,	Philadelphia,	Pa.	Lautz Bros.
Baker, Thomas Jennings,	Easton,	Md.	R. W. Cuthbert, Ph.G.
Baldauf, Julius Leopold, Ph.G.,	Henderson,	Ky.	J. A. Flexner.
Baumgartner, William Jacob,	Philadelphia,	Pa.	R. Kindig, M.D.
Beavers, Frank Washington,	Scranton,	Pa.	Geo. W. Jenkins.
Beck, Robert Wilbert,	Sharon,	Pa.	A. L. Beck, Ph.G.
Belt, James Ferris,	Wilmington,	Del.	Z. James Belt.
Bender, Edward Augustus,	Elm,	Pa.	L. C. Funk, Ph.G.
Berkemeyer, Francis Molton,	Philadelphia,	Pa.	L. C. Berkemeyer, M.D.
Berkstresser, W. J.,			
Besore, A. Stewart,	Shippensburg,	Pa.	J. L. Supplee, Ph.G.
Bietsch, George Edward,	Chambersburg,	Pa.	Wm. E. Lee, Ph.G.
Bitler, Harry,	Reading,	Pa.	Wm. M. Koenig.
Blackwood, Russell Thorn,	Bristol,	Pa.	Fred. Rapp, Ph.G.
Blair, Henry Cowan (3d),	Philadelphia,	Pa.	H. C. Blair's Sons.
Blow, Robert Gillingham,	Beverly,	N. J.	A. W. Taylor, M.D.
Boggs, Harry Leslie,	Charleston,	W. Va.	E. L. Boggs.
Boush, Albert Lewis,	Meadville,	Pa.	C. M. Zinck.
Boyer, Franklin Nagle,	Reading,	Pa.	J. A. Gingrich, Ph.G.
Boyles, Col. Jas. Clarkson,	Du Bois,	Pa.	Dr. R. M. Boyles.
Breisch, William H.,	White Haven,	Pa.	C. M. Driggs, Ph.G.
Bresser, Otto Carl,	Scranton,	Pa.	Carl Lorenz.
Brice, William Oscar,	Winnsboro,	S. C.	Chas. Shivers.
Brick, Harry Walter,	Fitchburg,	Mass.	Bullock & Crenshaw.
Bridgman, William George,	Liverpool,	England,	H. Lee Barber, Ph.G.
Brown, Albert Ludwig,	Reading,	Pa.	McCurdy & Durham.
Brown, Charles,	Philadelphia,	Pa.	W. J. Pechin, Ph.G.
Brown, Frank Luther,	Lebanon,	Pa.	R. P. Marshall, Ph.G.
Buckner, John Armstrong,	Pleasant Hill,	Mo.	E. T. Buckner, M.D.
Bunker, William Beatty,	Bellefontaine,	Ohio,	H. K. Mulford & Co.
Burdick, Arch Webster,	Carbondale,	Pa.	A. W. Reynolds.
Burnett, James H.,	Hackensack,	N. J.	Levi B. Hirst.
Butz, Alfred Sylvester,	Kutztown,	Pa.	F. M. Reed.
Cadmus, Alfred Brooks,	Philadelphia,	Pa.	John C. Keys, Ph.G.
Carney, George Elmer,	Philadelphia,	Pa.	H. Moll, Ph.G.
Carpenter, William Asbury,	Georgetown,	Del.	D. G. E. Musselman.
Carriat, Louise Michel,	Philadelphia,	Pa.	
Carson, Henry Martin,	Hastings,	Neb.	Carl D. S. Früh, Ph.G.
Casey, Harry English,	Philadelphia,	Pa.	Bullock & Crenshaw.
Castle, Abraham Lincoln,	Upland,	Pa.	J. J. Parker.
Christ, Franz,	Philadelphia,	Pa.	Dr. J. D. Moore, Ph.G.
Christman, Albert S.,	Allentown,	Pa.	E. J. Danowsky.
Clewell, William Henry,	Philadelphia,	Pa.	J. R. Elfreth, Ph.G.
Clingan, William Arthur,	Sioux City,	Ia.	F. Hansen.
Cochrane, Ardesco Bright,	Apollo,	Pa.	T. A. Cochrane.
Codville, Henry Lawson,	Philadelphia,	Pa.	C. G. A. Loder.
Colquhoun, John H.,	Upland,	Pa.	O. P. Hooper.
Comfort, Newton C.,	Mechanicsburg,	Pa.	Henry Müller, M.D.

Name.	*Place.*	*State.*	*Preceptor.*
Cooper, Herbert,	Dover,	Del.	H. S. Eckels.
Cope, Frank Henry,	Philadelphia,	Pa.	F. C. Reighter, Ph.G.
Costin, John Richard,	Centreville,	Md.	J. B. Moore.
Coxe, Russell Le Van,	Schuylkill Haven,	Pa.	H. N. Coxe.
Cunningham, T. S. M.,	Clarksville,	Tenn.	Askew & Edwards.
Dalton, David,	Upland,	Pa.	D. Alfred Dalton.
Davis, Harry Morgan,	Delaware Co.,	Pa.	Harry Cox, Ph.G.
Deen, William Lewis,	Lancaster,	Pa.	Richard H. Lackey, Ph.G.
De Vries, Robert Tivis,	Wheeling,	W. Va.	Charles Menkemeller, Ph.G.
Dickel, William John,	Philadelphia,	Pa.	F. F. Drueding, Ph.G.
Dierolf, Charles B.,	Mt. Joy,	Pa.	Dr. J. F. Meade.
Driesbach, Luther Albert,	Easton,	Pa.	William E. Hammon.
Dubbs, Robert Lovine,	Allentown,	Pa.	S. Gerhard, Ph.G.
Dunwody, Richard Gaillard,	Ph.G., Brunswick,	Ga.	
Eby, Edwin Stanton,	Newport,	Pa.	B. M. Eby.
Eckels, Charles Alfred,	Mechanicsburg,	Pa.	H. S. Eckels, Ph.G.
Elliott, Walter Roland,	Renovo,	Pa.	Wm. Hall, M.D.
England, William Taws,	Philadelphia,	Pa.	Robt. England, Ph.G.
Eppley, John Hake,	Three Rivers,	Mich.	
Eppstein, Jacob,	Hoppstaedter,	Germany,	C. E. Spencely, Ph.G.
Eshbach, William Wallace,	Bethlehem,	Pa.	Geo. P. Kern, M.D.
Faust, Jacob Mauger,	Pottstown,	Pa.	Dr. E. R. Smiley.
Ferguson, Enoch Pennock,	Coatesville,	Pa.	Jos. C. Roberts, Ph.G.
Fernsler, Edward Shoener,	Pottsville,	Pa.	J. N. Hodgson.
Fessler, Thomas Addison,	Muncy,	Pa.	D. S. Jones, Ph.G.
Fies, John Henry,	Lancaster,	Pa.	A. A. Hubley.
Finney, John Joseph,	Conshohocken,	Pa.	H. G. J. Hallowell.
Fisher, Thomas Leroy,	Peru,	Neb.	Edward H. Dort.
Frankelberger, Allen J.,	York Co.,	Pa.	J. J. Ottinger, Ph.G.
Fraunfelder, Richard Deily,	Easton,	Pa.	A. G. Gerhard & Co.
Fredericks, Harry,	Philadelphia,	Pa.	L. C. Funk, Ph.G.
French, Francis Freas,	Philadelphia,	Pa.	W. H. Koons, Ph.G.
Fry, Nelson Becker,	Harrisburg,	Pa.	James T. Shinn, Ph.G.
Garcia, Juan Reyes,	Porto Rico,	W. Ind.	Ramun Cleto Martin.
Garges, Alfred Batt,	Zanesville,	O.,	Harry Lippen.
Garland, John Kistler,	Centre,	Pa.	Rea & Jones.
Gerlach, Frank Christian,	Wooster,	Ohio,	J. Zimmerman & Co.
Gibbony, David Clarence,	Lisbon,	Iowa,	Sol. Kittering.
Glenk, Robert,	Philadelphia,	Pa.	W. T. Baker. Ph.G., dec.
Good, Benjamin Mylin,	Lancaster,	Pa.	Franklin P. Albright, Ph.G.
Goos, Charles,	Philadelphia,	Pa.	William A. Fetters, Ph.G.
Gordon, Jean, Miss,	Cincinnati,	Ohio,	W. B. Cleim, Ph.G.
Garrell, Jr., Benj. Harvey,	Lexington,	Va.	B. H. Gorrell.
Gressley, William Robert,	York,	Pa.	J. E. Lehman.
Grotevent, John Frederick,	Harrisburg,	Pa.	T. E. Conard, M.D.
Gruhler, Christian,	Shenandoah,	Pa.	A. Wasley.
Guest, Owen Lovejoy,	Swedesboro,	N. J.	Guest & Guest.
Haake, William Henry,	Cleveland,	Ohio,	A. Mayell & Co.
Hackney, George Wyley,	Uniontown,	Pa.	George B. Evans, Ph.G.
Hadley, Harry Cornish,	Kennett Sq.,	Pa.	D. W. Hutchison.
Hague, William Henry,	Barnesville,	Ohio,	T. W. Potts, Ph.G.
Haines, Joseph Ridgway,	Lumberton,	N. J.	Prickitt & Barrington.
Hammerquist, Charles Edward,	Jamestown,	N. Y.	H. C. Lawall, Ph.G.
Hankey, William Tabor,	Trempealean,	Wis.	T. H. Spence.
Hartman, Frank Gast,	Lancaster,	Pa.	Dr. Samuel B. McCleery.
Hasson, Harry Decora,	Phillipsburg,	Pa.	D. H. Ross, Ph.G.
Haydock, Susannah Garrigues,	Philadelphia,	Pa.	Susan Hayhurst, M.D. Ph.G
Head, Raymond Cyril Joseph,	Latrobe,	Pa.	Dr. H. S. Bossert.
Heckler, Jr., Franklin Jacob,	Columbia,	Pa.	P. S. Brugh.

Name.	*Place.*	*State.*	*Preceptor.*
Henry, William Frederick,	Bellaire,	Ohio,	M. N. Mercer.
Herber, Conrad J. A. S.	Terre Haute,	Ind.	John F. Gulick.
Hickman, Thomas Rlwood,	Wayne, Del. Co.	Pa.	Wm. H. Hickman, M.D.
Hoch, Jacob,	Easton,	Pa.	Wm. H. Lantz, Ph.G.
Hohman, Theodore Albert,	Wheeling,	W. Va.	C. R. Goetze.
Horn, Edgar Austin,	Leighton,	Pa.	Dr. C. I. Horn.
Hornby, Walter Melvin,	Roxborough,	Pa.	Harry H. Anderson.
Hough, John Wallace,	Shippensburg,	Pa.	J. C. Altick & Co.
Hudson, Charles Marcus,	Stockton,	Md.	Edgar Fontaine.
Hutchison, Burtt Taylor,	Bangor,	Pa.	S. E. R. Hassinger, Ph.G.
Irvine, Jr., John,	Carlisle,	Pa.	A. Tatem.
Jones, William Hewitt,	Lansford,	Pa.	Dr. J. Benj. Jones.
Keppler, Charles Lewis,	New Orleans,	La.	C. L. Keppler.
Kessler, Edward Francis,	Logan,	Ohio,	F. W. E. Stedem.
Keyes, James E.,	Oneonta,	N. Y.	E. E. Ford.
Kiger, Harry Stiles,	Wilmington,	Pa.	H. C. Snitzer, M.D.
Kinsel, Grant Arthur,	Lewistown,	Pa.	A. P. Martin.
Kitchen, Charles E.,	Piqua,	Ohio,	Pearl I. Hedges.
Knowles, George Alexander,	Philadelphia,	Pa.	Bullock & Crenshaw.
Koch, Lewis Homer,	Leetonia,	Ohio,	Harper & Witzeman.
Koenig, Albert,	Philadelphia,	Pa.	Decatur Milligan, Ph.G.
Kogetschatz, William,	Martinsburg,	W. Va.	Barclay Hall.
Krall, George Heyde,	Mechanicsburg,	Pa.	Eberly Bros.
Krebs, Harry J.,	Mahanoy City,	Pa.	Alexander A. Weber.
Krebs, Paul,	Cleveland,	Ohio,	Herman Krebs.
Kulp, William Austin,	Lock Haven,	Pa.	T. C. Hilton & Co.
Lack, C. Eugene,	Bethlehem,	Pa.	H. A. Burkhart, Ph.G.
LaDow, Addington,	Newport,	N. J.	J. P. Frey, Ph. G.
Laessle, Henry Adolph,	Philadelphia,	Pa.	Dr. F. Seitz, Ph.G.
Landis, Charles Paul,	Philadelphia,	Pa.	C. Petzelt.
Landon, Francis Patterson,	Salem,	Va.	F. W. Fenn, Ph.G.
La Place, Edgar Ranson,	Deep River,	Conn.	Thomas L. Parker.
Lefferts, Henry Tomlinson,	Southampton,	Pa.	Jos. V. Antill, M.D., Ph.G.
Lehman, Edward,	Memphis,	Tenn.	Dowdy & Co.
Leinbach, Frank Irvin,	Lewisburg,	Pa.	T. D. Baker, Ph.G.
Lupin, Emanuel,		Russia	H. K. Mulford & Co.
Lupus, Herman Ernest,	Camden,	N. J.	Alexandria A. Weber.
Lutz, William Dellet,	Germantown,	Pa.	Thos. L. Buckman, Ph.G.
Lyons, Frank Floyd,	Youngstown,	Ohio,	McEwen & Breaden.
McCandless, Edward Sloan,	Philadelphia,	Pa.	H. C. Eddy.
McClintook, James,	Germantown,	Pa.	W. H. Poley.
McDonnell, Charles Pancratius,	Philadelphia,	Pa.	Jas. M. Wallis, M.D.
McFarland, Robert,	Philadelphia,	Pa.	W. V. Stansbury.
McGregor, Eugene Charles,	Columbia,	S. C.	W. C. McGregor.
McLaughlin, Philip Celestine,	York City,	Pa.	Dale, Hart & Co.
McMeekan, Charles James Harvey,	Philadelphia,	Pa.	Dr. Harrison Duffield.
McNabb, Henry Steely,	Belleville,	Pa.	James T. Shinn, Ph.G.
MacLennan, William Feinour,	Philadelphia,	Pa.	H. Lautenbacher.
Main, Clinton Eugene,	Frederick,	Md.	S. Schley & Bro.
Manning, Charles La Forge,	Trenton,	N. J.	Wm. H. Laubach, Jr.
Manter, Fred. Augustus,	Farmington,	Me.	W. H. Braddock, Ph.G.
Markley, William Arnold,	Reading,	Pa.	Wm. Weis, Ph.G.
Matthews, Edgar Morton,	Jefferson,	Ga.	A. A. Bell.
Mendenhall, Harry Carleton,	Bloomsburg,	Pa.	
Mengel, Levi Walter,	Reading,	Pa.	Chas. M. Steinmetz, Ph.G.
Merkel, Wm. M.,	Minersville,	Pa.	Dr. J. M. Bradford.
Meroney, John Patrick,	Camden,	S. C.	Dessausure & De Lorme.
Meyers, Quillas Albert,	Petersville,	Pa.	Stewart M. Hohl.
Miller, Frank,	Danville,	Pa.	Dr. S. Y. Thompson.

Name.	*Place.*	*State.*	*Preceptor.*
Mitchell, Henry,	Philadelphia,	Pa.	Chas. W. Hallowell, Ph.G.
Moore, James Johnson,	Dillsburg,	Pa.	Dr. H. W. Fishel.
Morales, Guadalupe,	Nicaragua,	C. America,	Dr. Morales.
Mueller, Charles August,	Philadelphia,	Pa.	A. G. Keller.
Muhn, Harry Jacob,	Wheeling,	W. Va.	Chas. Menkemeller, Ph.G.
Murrell, Alexander Harrison,	Allen,	Md.	Dr. H. H. Sherk.
Mustard, Frank Havelin,	Philadelphia,	Pa.	A. E. Norton, M.D.
Myers, Arnold Armstrong,	York,	Pa.	Dr. E. C. Warg.
Myers, Harry Joseph, Jr.,	Philadelphia,	Pa.	J. B. Cook.
Nickum, Elwood George,	Bethlehem,	Pa.	Dr. C. B. Lowe, Ph.G.
Noon, Edward John,	Philadelphia,	Pa.	Louis Genois, Ph.G.
Odbert, James Henry,	Wheeling,	W. Va.	Thos. H. Potts, Ph.G.
Ogden, Charles Sheppard,	Camden,	N. J.	U. F. Richards, Ph.G.
Otis, Amos Ray,	Hicksville,	Ohio,	L. S. Loughridge.
Parvin, Harry Rocap,	Bridgeton,	N. J.	H. F. Seeley, Ph.G.
Paxson, Elmer May,	Philadelphia,	Pa.	H. James Batdorff, Ph.G.
Pazmiño, Francisco,	Ecuador,	S. A.	H. C. Manloe.
Peacock, Josiah Comegys,	Millington,	Md.	H. Trimble, Ph.G.
Pentz, John Flemming,	Easton,	Pa.	Stewart M. Hohl.
Petrie, Jr., Alexander Bain,	Guelph, Ontario,	Can.	John A. Clark.
Pfeuffer, William R.,	New Braunfels,	Tex.	John V. Bodenmann.
Pfromm, George Washington,	Philadelphia,	Pa.	D. S. Wiltberger.
Phillips, Lehman Blew,	Bridgeton,	N. J.	Geo. H. Whipple.
Post, Francis Elmer,	Towanda,	Pa.	Horace C. Lutz.
Pratt, William Henry,	Camden,	N. J.	L. H. Wilson.
Randal, Harry Lee,	Shepherdstown,	W. Va.	C. C. Sanderson.
Randolph, Budd Alfred,	Houston,	Tex.	Dr. E. L. E. Castleton, Ph.G.
Randolph, Thomas Owen F.,	Versailles,	Ohio,	T. M. Newbold, Ph.G.
Raub, Frederick Miller Dickson,	Lancaster,	Pa.	Dr. M. W. Raub.
Raudenbush, Charles Hunter,	Reading,	Pa.	J. H. Stein, Ph.G.
Reap, Edward Augustine,	Pittston,	Pa.	Jos. Feldman.
Reif, Ernest,	Philadelphia,	Pa.	Lewis J. Steltzer.
Remington, Samuel Jacobs,	Philadelphia,	Pa.	John Ogden.
Reuss, William Henry,	Philadelphia,	Pa.	Wm. H. Morrett.
Rhoads, Harry Paist,	Asbury Park,	N. J.	Dr. T. E. Conard, Ph.G.
Richardson, Harry,	Dover,	Del.	
Richardson, James Henry,	Charlestown,	Md.	S. R. Kirk, M.D.
Riegel, Samuel Jacob,	Lebanon,	Pa.	Jos. L. Lemberger.
Rinedoller, Robert Grant,	Philadelphia,	Pa.	Wiley & Wallace Co.
Rinker, Francis,	Mt. Airy,	Pa.	J. A. Jeffries.
Roth, Theodore William,	Philadelphia,	Pa.	Geo. H. Ischler, M.D., Ph.G.
Ruff, U. Gilbert,	Bryansville,	Pa.	S. E. R. Hassinger, Ph.G.
Ruhl, Harry Fry,	Manheim,	Pa.	W. E. Moyer.
Schaak, Milton Franklin,	Lebanon,	Pa.	G. W. Schools, Ph.G.
Scheirer, Franklin Benjamin,	Hokendauqua,	Pa.	W. A. Rumsey, Ph.G.
Scherer, Bernhard Frederick,	Philadelphia,	Pa.	C. E. Haenchen.
Schetky, Laurence Oliphant,	Mt. Holly,	N. J.	Prickitt & Barrington.
Schloer, Charles Albert,	New York,	N. Y.	C. A. Usilton.
Schmidt, Justus,	Dayton,	Ohio,	H. F. James.
Scott, Robert Burns,	Philadelphia,	Pa.	Dr. John S. Ranck.
Seltzer, Charles Jacob,	Coatesville,	Pa.	W. S. Young, Ph.G.
Shafer, Erwin Clement,	Montoursville,	Pa.	G. C. Saeger, M.D.
Shore, Thomas Walter,	Germantown,	Pa.	J. L. Kooker, Ph.G.
Shull, Carl Whittaker,	Bridgeton,	N. J.	J. V. Slaughter, Ph.G.
Shuman, Calvin Bruce,	Mainville,	Pa.	Geo. W. Henry, Ph.G.
Simmons, George Arthur,	Moores,	Pa.	F. E. Harrison, Ph.G.
Singer, Robert Lamberton,	Harrisburg,	Pa.	A. E. Eyster.
Sitgreaves, Wesley Cline,	Vincentown,	N. J.	F. S. Hilliard,
Smith, Albert,	Parsons,	Kan.	Irvine Smith.

Name.	*Place.*	*State.*	*Preceptor.*
Smith, Benjamin Franklin,	Harrisburg,	Pa.	J. Wilson Hoffa, Ph.G.
Smith, Charles Adams,	Obolds,	Pa.	C. J. V. Fries, Ph.G.
Smith, George Anselm,	Nazareth,	Pa.	B. C. Watermann, Ph.G.
Smith, Harry Allen,	Philadelphia,	Pa.	Van Buskirk & Apple.
Smith, Herbert Johnson,	Elkton,	Md.	T. C. Tomlinson, M.D.
Speer, Edgar Lacy,	Chambersburg,	Pa.	J. S. Nixon & Son.
Spencer, Edward Thomas,	Newville,	Pa.	H. K. Mulford & Co.
Spragle, Elmer,	Bartonsville,	Pa.	G. W. Barton, Ph.G.
Stein, Edward Theodore North,	Millersville,	Pa.	Jacob H. Stein, Ph.G.
Steinau, Lee,	Monroe,	La.	Thos. Y. Aby, M.D.
Steiner, Ephraim Henry,	South Easton,	Pa.	A. N. Richards.
Stem, Harvey Nevin,	Allentown,	Pa.	Heiberger & Stem.
Stiles, William H.,	Camden,	N. J.	E. C. Jones & Co.
Stimmel, Walter,	Wilmington,	Del.	P. Steelman.
Stoffregen, Louis Franklin,	Pottsville,	Pa.	C. S. Commings, Ph.G.
Stout, Oliver,	Philadelphia,	Pa.	J. L. Supplee, Ph.G.
Strode, William Alvah,	Elmira,	N. Y.	H. C. Blair's Sons.
Strouse, Theodore Herman,	Pottsville,	Pa.	H. F. Vorhage.
Sultzbach, Harry Miller,	Marietta,	Pa.	A. D. Wike, Ph.G.
Swartley, Harry C.,	Norristown,	Pa.	W. H. Llewellyn.
Sweeney, Joseph Henry,	Ellsworth,	Minn.	John M. Rudolph, Ph.G.
Taggart, George Corson,	Norristown,	Pa.	Atwood Yeakle.
Taggart, Howard M.,	Philadelphia,	Pa.	C. H. Wagner, Ph.G.
Taylor, Harry Baker,	Altoona,	Pa.	E. L. Taylor.
Taylor, Merle Hampton,	Butler,	Pa.	J. H. Parks.
Teeple, Harry Sutherland,	Philadelphia,	Pa.	G. W. Wolfersberger, Ph.G.
Thompson, Oan Joshua,	Reading,	Pa.	J. H. Burkwalter.
Tielke, Maxwell Gustav,	Cleveland,	Ohio,	G. Tielke.
Van Buskirk, Frank,	Bethlehem,	Pa.	S. L. Van Buskirk, Ph.G.
Van Dyke, Alfred Nelson,	Van Dyke,	Pa.	Frank P. Linns.
Venn, Joseph,	Memphis,	Tenn.	J. Goldbaum.
Voss, Frederick John,	Borgloh, Hanover,		F. F. Drueding, M.D. Ph.G.
Wahle, Edwin,	Davenport,	Ia.	Theo. H. Busch,
Walls, John Henry,	Media,	Pa.	A. Roidot.
Walter, Andrew Wendell,	Philadelphia,	Pa.	John B. Ferguson.
Wamsley, James Winter,	Gloucester,	N. J.	J. A. Wamsley, M.D.
Ward, Robert Toomer,	Daviston,	Ala.	L. C. Ward, M.D.
Waterall, Charles Albert,	Philadelphia,	Pa.	Wm. Waterall & Co.
Weber, Frank Charles,	Meadville,	Pa.	C. M. Zinck.
Weber, Frank Nicholas,	Millville,	N. J.	Geo. W. Weber, Ph.G.
Wescott, Frank,	Media,	Pa.	W. E. Dickeson, Ph.G.
Weston, Geary Augustus,	Millersville,	Pa.	A. A. Hubley.
Whipple, Oscar Kellog,	Bridgeton,	N. J.	George H. Whipple.
Whitaker, George Nixon,	Cedarville,	N. J.	H. C. Manlove, Ph.G.
White, Frank Willett,	Atchison,	Kan.	A. H. Leyman.
White, Ishmael James,	Baltimore,	Md.	W. G. Nebig.
Williams, Clarence Edward,	Philadelphia,	Pa.	Bullock & Crenshaw.
Wittel, John Kaler,	Florin,	Pa.	Leidy Seipel.
Woertz, George A.,	Philadelphia,	Pa.	W. A. Auffurth.
Wolfenden, Benjamin Franklin,	Upland,	Pa.	Wm. Procter Jr. & Co.
Wolff, Oliver Brown,	Dry Run,	Pa.	Robt. McNeil, Jr.
Wollmuth, Richard J.,	Bethlehem,	Pa.	Paul Kempsmith.
Zeainer, Harry Wisler,	Columbia,	Pa.	W. H. Llewellyn.
Zeller, John Paul,	Mifflinburgh,	Pa.	Dr. E. S. Beary, Ph.G.
Zerr, Samuel N.,	Reading,	Pa.	P. M. Ziegler.
Ziegler, Albert Lewis,	York,	Pa.	R. Wm. Ziegler, Ph.G.